AGRICULTURAL CHEMICALS

DDT

Technical Grades and
Dry Wettable Concentrates
Dust Base Concentrates
Emulsifiable Concentrates
Solvent Concentrates

General Chemical Technical Grade DDT is available in either the *finely ground* or the small, *thin flake* types that insure easy handling and processing in your milled or oil-base products. The flake type offers processing efficiencies and economies that are well worth investigating. Samples available.

BASIC CHEMICALS

GC

FOR AMERICAN INDUSTRY

General Chemical's DDT materials are developments of research, production and quality control facilities that are among the nation's foremost. This combination—together with nearly half a century of experience and leadership "in insecticides"—is your assurance that you will always obtain DDT materials of uniformly high quality on every purchase from General Chemical. For your needs . . . write or phone nearest General Chemical Office below.

GENERAL CHEMICAL DDT PRODUCTS:

- DDT TECHNICAL, Finely Ground
- DDT TECHNICAL, Thin Flake
- GENITOX* S-50 (50% DDT Wettable, Microfine)
- GENITOX D-50 (50% Dust Base, Microfine)
- GENITOL* EM-25 (25% Emulsifiable)
- GENITOL EM-30 (30% Emulsifiable)
- GENITOL SC-30 (30% Solvent Concentrate)
- GENITOL SC-40 (40% Solvent Concentrate)

*Reg. U. S. Pat. Off.

GENERAL CHEMICAL DIVISION

ALLIED CHEMICAL & DYE CORPORATION

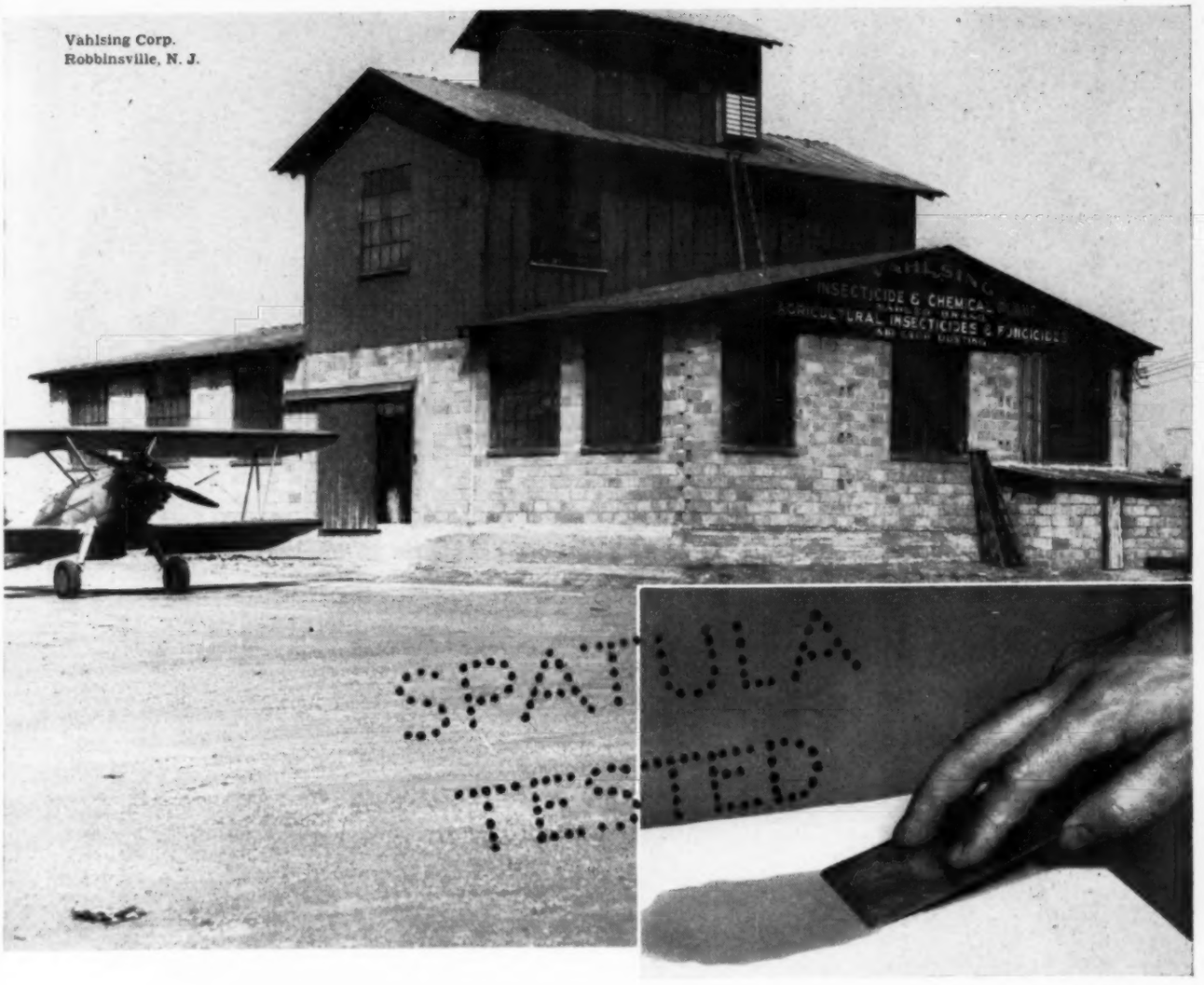
40 Rector Street, New York 6, N. Y.

Makers of the Nation's Foremost ORCHARD BRAND *Insecticides and Fungicides*

Offices: Albany • Atlanta • Baltimore • Birmingham • Boston • Bridgeport • Buffalo • Charlotte Chicago • Cleveland • Denver • Detroit • Houston • Kansas City • Los Angeles • Minneapolis New York • Philadelphia • Pittsburgh • Portland (Ore.) • Providence • San Francisco • Seattle St. Louis • Wenatchee • Yakima (Wash.)

In Wisconsin: General Chemical Company, Inc., Milwaukee, Wis.

In Canada: The Nichols Chemical Company, Limited • Montreal • Toronto • Vancouver



Intimate blends *by Sprout Waldron*
take to the air . . .

In meeting the ever-changing formula needs on an S. O. S. basis, air-dusting of insecticides and fungicides is setting new standards in crop protection. Every growing season the Vahlsing Insect and Disease Control Service is proving this fact.

Behind the whirling propellers and skilled flying techniques stand scientific scheduling and a Sprout-Waldron Intimate Blending System.

The correct formula, free from streaks and ready to fly within an hour's notice, calls for flexible, high capacity insecticide and fungicide production. This modern producer demands equipment which is accessible for rapid, thorough cleaning . . . equipment which assures dust-free operation.

Sprout-Waldron Intimate Blending Systems meet these requisites admirably. For **air-handling,** they provide fresh blends which are light, lump-free and well aerated.

Why not bring Sprout-Waldron your insecticide blending problems? Write or phone Sprout-Waldron & Company, Muncy, Pa.

27

SPROUT WALDRON
Manufacturing Engineers

Make your finished dusts <u>well-conditioned</u> . . .

with ATTACLAY!

By using Attaclay as extender or conditioner, finished dust blenders and their grower-customers both benefit.

Blenders take advantage of Attaclay's low bulk density to adjust the bulk of finished dusts. As a result, their whole line of crop dusts has a near-uniform volume. Packages and containers become standardized—mixing procedures streamlined. What's more, they work with a highly adsorptive, free-flowing material that eases many blending steps.

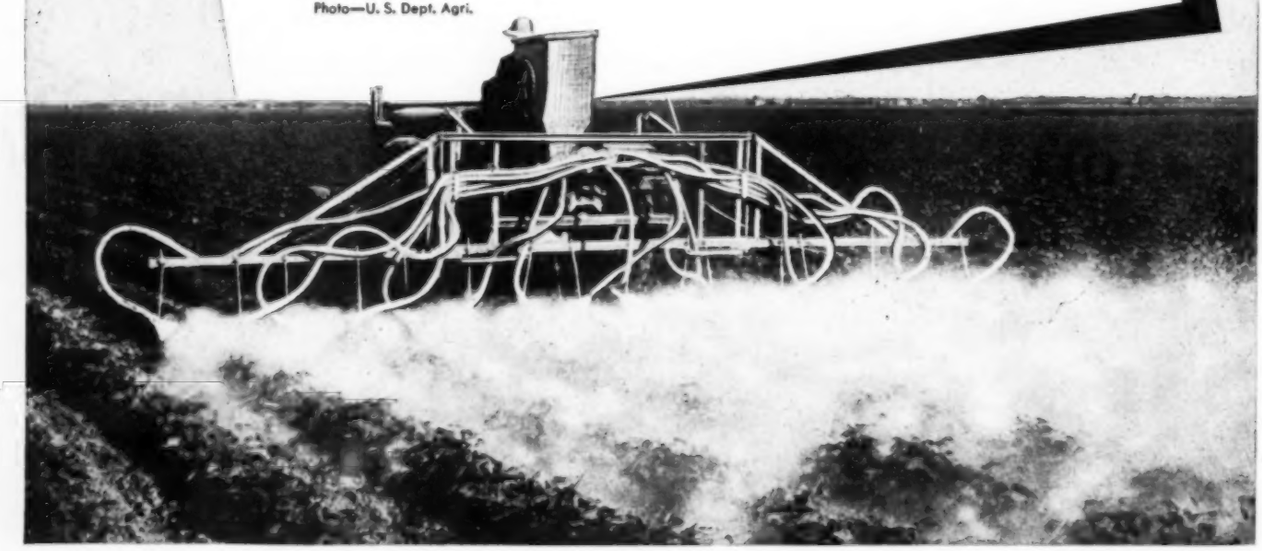
Growers benefit, too. They don't have to constantly adjust their rigs or speeds to compensate for "light" or "heavy" dusts. Besides, many growers know from experience how well Attaclay-mixed dusts will flow, disperse, settle, cover, stick and kill—how its lack of abrasiveness lengthens rig life.

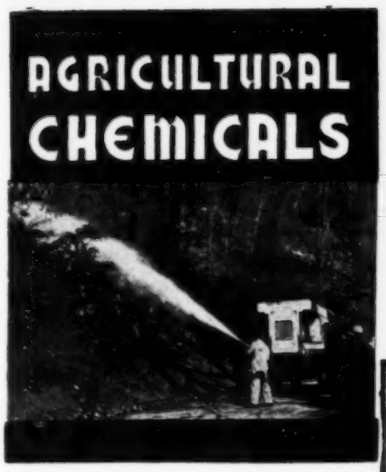
Look into our diluent for *your* finished dust formulations. All the good points that make Attaclay so popular with concentrate makers will work equally well to *your* profit. A generous, free sample is yours for the asking.

ATTAPULGUS CLAY COMPANY

Dept. P. 210 West Washington Square, Phila. 5, Pa.

Photo—U. S. Dept. Agri.





THIS MONTH'S COVER

Keeping pace with the rapid advance of new organic insecticides and fungicides is one of the problems of the makers of application equipment. Great advancement has been made in recent years in the development of such equipment. This photo taken at recent "Mist Blower School" held at New Haven, Conn., typifies the ability of sprayers to cover difficult spots in pest control. (Photo courtesy Conn. Agricultural Exp. Station).

MAY 1948
VOL. III No. 5

A Monthly Magazine For the Trade

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In This Issue:

Editorials 21
Evaluation of Toxicants 23
By J. M. Ginsburg
Chemical Weed Treatment in Corn 25
By A. S. Crafts
Flowing Properties of Ammonium Sulfate 28
Benzene Hexachloride Tests 30
By B. H. Driggers
Deficiencies of Micro-Nutrients 35
By C. Emlen Scott
Committee Discusses 2,4-D Drift 41
American Plant Food Council Meets 43
Nat'l Fertilizer Association Meets 47
Listening Post 49
By G. J. Haeussler & P. R. Miller
Suppliers Bulletins 53
Technical Briefs 55
Experiment Station Digest 59
By H. H. Slawson
Industry News 61
Industry Patents, Trade Marks 87
Classified Advertising 88
Advertisers' Index 89
Tale Ends 90

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TOXAPHENE

(HERCULES CHLORINATED CAMPHENE)

Here is *another* pest control problem solved by Toxaphene*. In widely increasing use this year among cotton farmers throughout the nation, to control the boll weevil and other insects, Toxaphene [Hercules Chlorinated Camphene] is also demonstrating its effectiveness in combating the grasshopper.

Tests by the U. S. Department of Agriculture and other qualified authorities show that dusts or sprays made with Toxaphene will rapidly kill the grasshopper and stop further migration of this pest.

Specific recommendations on the use of Toxaphene can be obtained from individual state authorities. For technical information on this toxicant as an ingredient in finished dusts and sprays, write:

TOXAPHENE ALSO KILLS

BOLL WEEVIL
BOLLWORM
SOUTHERN GREEN STINK BUG
COTTON LEAFWORM
COTTON APHID
RAPID PLANT BUG
TARNISHED PLANT BUG
COTTON FLEAHOPPER
THRIPS
MANY OTHER
AGRICULTURAL INSECT PESTS

HERCULES POWDER COMPANY

INCORPORATED

970 MARKET ST., WILMINGTON 99, DELAWARE

*Reg. U. S. Pat. Off.

This is what happens when a weed gets

2-4 Dow Weed Killer

You simply spray with 2-4 Dow Weed Killer, wetting the tops of weeds thoroughly.

Gradually—but surely—the plant twists and shrivels.

When the chemical reaches the roots—the weed is doomed!

It's amazing—the way 2-4 Dow Weed Killer gets so many weeds! Why grub or hoe or cultivate in the hot sun? Instead just spray it on with a knapsack sprayer, power equipment or airplane. Think of the advantages: easier, cheaper weed control, bigger crop yields and higher net returns on such crops as corn, small grains, rice, sugar cane, flax and grass seed crops.

Get the facts about 2-4 Dow Weed Killer (Formula 40) liquid, 2-4 Dow Weed Killer (Sodium Salt) powder and Esteron 44 (isopropyl ester of 2,4-D). Ask your county agent or state experiment station. Ask your dealer, or write to Dow.

Spray your weeds to death with Dow Weed Killers

AGRICULTURAL CHEMICAL DIVISION

THE DOW CHEMICAL COMPANY • MIDLAND, MICHIGAN

FIELD NOTES

2-4 DOW WEED KILLER, FORMULA 40 (AMINE SALT) IDEAL FOR LOW VOLUME APPLICATION

2-4 Dow Weed Killer, Formula 40 is bad news for weeds in turf, pastures and small grains. This formulation mixes readily with water in any proportion and can be used effectively in low volume applications, in 5 to 20 gallons of water per acre by ground equipment or 1 to 5 gallons by airplane. In small grains, rice, corn, flax, grass crops, sugar cane, the formulation will selectively control mustards, wild radish, fan weed, alligator weed, indigo and many other annual and perennial weeds.

GARDEN DOWFUME IS BOON TO HOME GARDENERS

Garden Dowfume (containing Ethylene Dibromide) offers home gardeners an effective, economical way to control nematodes, wire-worms and other soil pests without the necessity of special equipment for application. First, the soil is prepared in the normal manner for planting, with clods broken up and the surface firmed and made smooth. Then, Garden Dowfume is poured into furrows dug 6 inches deep and 12 inches apart. Or the garden plot may be marked off in 12-inch squares and holes punched 6 inches deep at each injection point. Two to three teaspoonfuls of Garden Dowfume are then applied to each hole. In each case, openings are filled in and packed as soon as they are treated. Fourteen days should elapse before planting seeds or setting out plants—longer if soil is excessively cold and wet. One gallon of Garden Dowfume treats 400 square feet.

DOWKLOR COVERS THE FARM FRONT

Dowklor, new Dow Chlordane insecticide, serves in many ways to help the farmer get rid of insects infesting orchards, groves, vineyards, field crops, greenhouses, nurseries and lawns.

The big news is grasshopper control, which Dowklor accomplishes at a cost of a few dollars per acre in such crops as wheat, barley, flax, alfalfa, corn, oats and rye. Dowklor formulations have also proved effective when used as recommended against many common insects which threaten orchards and vegetable and truck gardens. Three formulations are available: Dowklor-40%-Wettable, Dowklor-40%-Emulsifiable, and Dowklor-5%-Dust for household use.

For complete information on any of these chemical aids to scientific agriculture, ask your dealer or local experiment station. Or write to Dow.

DOW

CHEMICALS INDISPENSABLE TO INDUSTRY AND AGRICULTURE

send for this new book

Latest information on Santobane (Monsanto DDT) is contained in a new 28-page book, now available on request. Covering all phases of DDT formulation and application, this material was compiled to help manufacturers and formulators of insecticides make the most effective and profitable use of Santobane.

For your copy of "Santobane (Monsanto DDT)," write to Monsanto's Organic Chemicals Division or ask for it on the convenient coupon.

Santobane: Reg. U. S. Pat. Of.

(Reproduction of full-color illustration for advertisement appearing in February 28 issue of Business Week, March 15 issue of Time and March 22 issue of Newsweek.)

Public learns about

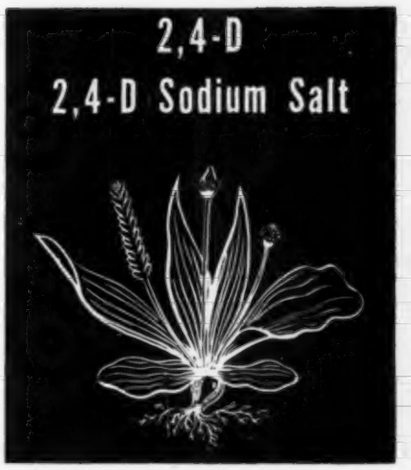
NIFOS-T

(Monsanto Tetraethyl Pyrophosphate, Technical)

A recent 4-color, full-page Monsanto advertisement brings to 2½ million readers of national publications news of how Nifos-T (Monsanto Tetraethyl Pyrophosphate, Technical) destroys farm, orchard and greenhouse pests. The satisfying response to this advertisement, from the United States and Canada, indicates wide public interest in effective control of damaging insects.

Most manufacturers and formulators of insecticides are already familiar with the power and economy of Nifos-T in eliminating aphids, mites, thrips and a host of other pests. They may now count on the added sales and profit possibilities arising from the knowledge that many more potential users are familiar with the advantages of Nifos-T in insect control.

Application, formulation and technical data are contained in a new Monsanto folder on Nifos-T. Write to Monsanto's Organic Chemicals Division for your copy . . . or simply note your request on the coupon.



Monsanto 2,4-D and 2,4-D Sodium Salt, when properly formulated, provide effective and economical control of many annual weeds, deeply-rooted perennials, woody shrubs and trees that cause large annual losses in crops.

A selective killer, 2,4-D is furnished by Monsanto as either insoluble 2,4-D Acid, or water-soluble 2,4-D Sodium Salt. Although present supplies are limited, formulators and processors are invited to contact Monsanto regarding their requirements.

MONSANTO CHEMICAL COMPANY, Organic Chemicals Division, 1700 South Second Street, St. Louis 4, Missouri. District Sales Offices: New York, Philadelphia, Chicago, Boston, Detroit, Cleveland, Akron, Cincinnati, Charlotte, Birmingham, Houston, Los Angeles, San Francisco, Seattle. In Canada: Monsanto (Canada) Limited, Montreal.

MONSANTO
CHEMICALS — PLASTICS

SERVING INDUSTRY... WHICH SERVES MANKIND

MONSANTO CHEMICAL COMPANY ACS-5
Organic Chemicals Division, 1700 South Second Street
St. Louis 4, Missouri

Please send me further information on _____

_____

Name _____ *Title* _____

Company _____

Type of Business _____

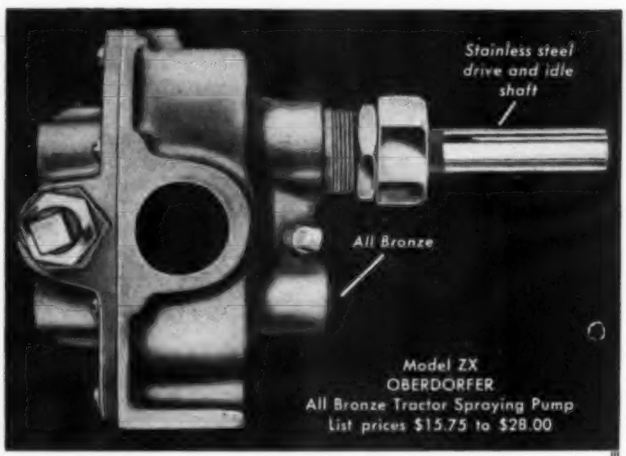
Address _____

City _____ *State* _____

6000 new spraying chemicals are under development — *mostly corrosive*

STANDARDIZE NOW ON CORROSION-RESISTANT

OBERDORFER BRONZE SPRAYING PUMPS

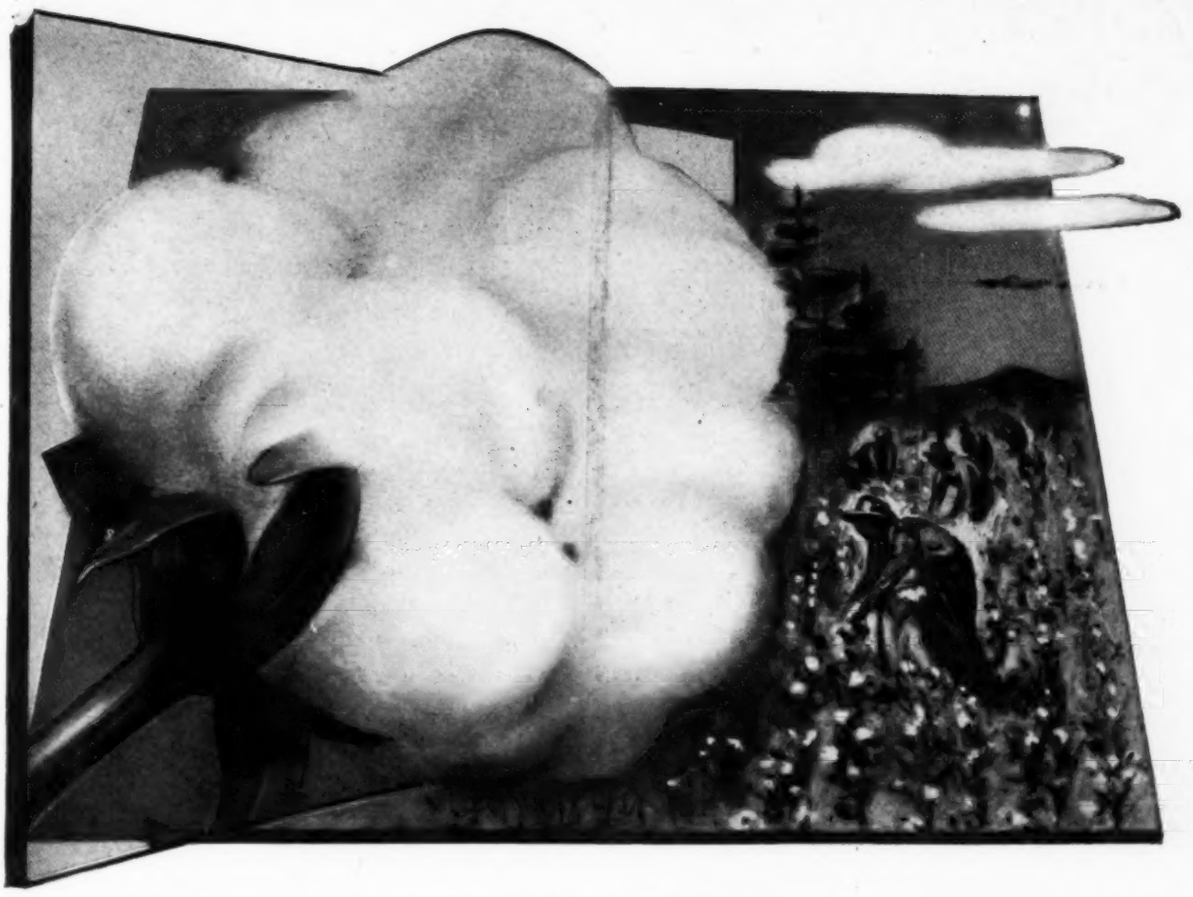


1. No corrosion with bronze and stainless steel.
2. Pressures up to 150 pounds per square inch.
3. Built-in adjustable pressure relief valve.
4. Lower cost than iron of similar design.
5. No priming to 15 feet below pump.
6. Four large Alemite lubricated bearings.
7. Easily installed by any mechanic.
8. ¼", ⅜", ½", ¾" and 1" standard pipe connections.
9. Backed by 50 years of bronze pump manufacturing.
10. All metal — no rubber.
11. From 2 gallons to 600 gallons per acre.

Our conversations with leading chemical manufacturers reveal that over 6,000 different herbicides, insecticides and fungicides for agricultural spraying, in addition to those now on the market, are in the experimental stage. Many of them are of a highly corrosive nature. This vast activity is the forerunner of a selective spraying program using specific chemicals for each individual application, depending on crop, growth or soil to be treated.

Corrosion-resistant pumps are highly desirable with today's chemicals. By next year, with many new corrosive spraying chemicals in use, *they will be a necessity*. Those spraying equipment manufacturers who look ahead will want to start now to use the *standard* corrosion-resistant pumps—Oberdorfer Bronze Pumps. Spraying rigs so equipped will last longer—offer greater sales appeal. And those manufacturers using Oberdorfer Pumps this year will have an assured source of supply for next year when corrosion-resistant pumps will be required. In its 71-year history, Oberdorfer has established an enviable record of filling *all* the needs of regular customers.

Agricultural Pump Division
Oberdorfer Foundries, Inc.
5400 Thompson Rd.—Syracuse, N. Y.



FOR BETTER INSECT CONTROL—

Build your COTTON INSECTICIDES around Baker's BHC!

Results with BHC (Benzene Hexachloride) have been outstanding in the control of the boll weevil, cotton aphid, cotton leafworm, and cotton fleahopper—all the important cotton insects, except the boll worm and red spider.

Since DDT is effective for use against the bollworm, a mixture of DDT and BHC makes an excellent all-purpose dust for cotton. A combination of 5 per cent DDT and 2.88 per cent gamma isomer BHC has given yields of 1,171 pounds of cotton—compared with 917 pounds for calcium arsenate and 310 pounds for no treatment. As an all-purpose cotton dust a mixture containing 3 per cent gamma isomer BHC, 5 per cent DDT and 40 per cent sulfur has also been reported recently to be especially effective.

Where aphids are prevalent, BHC is especially valuable, since aphids are not economically controlled by other insecticides.

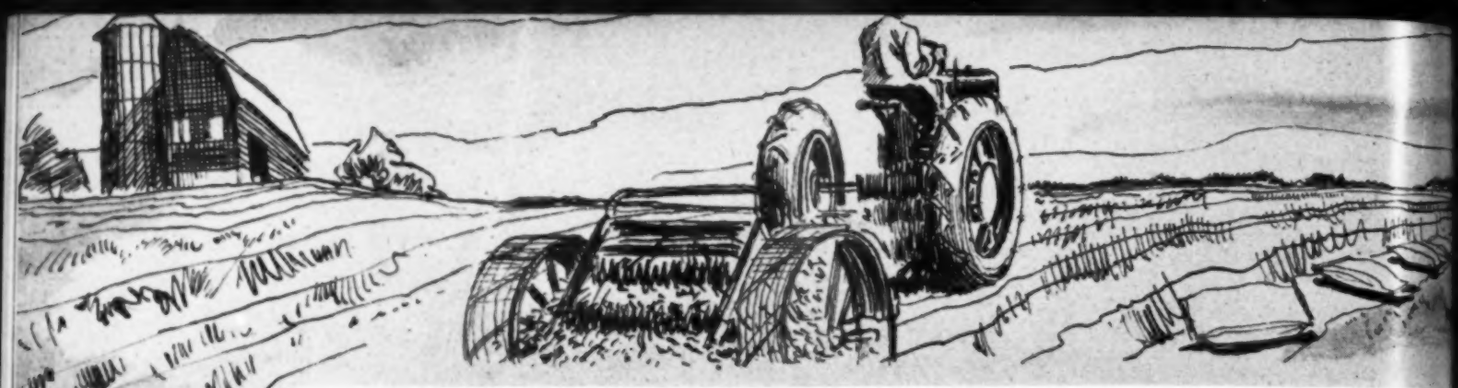
If you are in a position to formulate insecticides and distribute them in the Cotton Belt—Baker's BHC offers you an excellent opportunity to create sales.

Baker's BHC Technical contains a guaranteed minimum of 12 per cent gamma isomer as determined by infra-red assay. It is ready to be formulated into dusts, pastes, wettable powders, liquid concentrates and emulsifiable solutions.

Baker's BHC is available in 25, 50, 100 and 200 pound containers, up to carload lots. Test samples available to formulators. Write today for free bulletin and prices. Address *Agricultural Chemical Division,* J. T. Baker Chemical Co., 66 South Main St., Phillipsburg, N. J.

Baker's Agricultural Chemicals Sales Leaders: **DDT • 2,4-D FORMULATIONS • BHC • ANTU**

Baker's Agricultural Chemicals



MORE MULTIWALLS

New Kraft Center at Pensacola .....BUILT FOR YOUR NEEDS

It's working for you *now*—the largest integrated operation of its kind! Pensacola's new Kraft Center combines the output of two kraft mills—Florida Pulp and Paper Company and Alabama Pulp and Paper Company (both wholly owned St. Regis subsidiaries) with the output of the new St. Regis multiwall bag plant.

This is further evidence of our earnest wish to serve the demands of the many basic industries which have adopted St. Regis multiwall paper bags. We cannot yet promise you all the bags you want, exactly when you want them. But we are steadily moving toward that goal.

Pensacola's new Kraft Center is a big step forward. From trees to pulp . . . to kraft paper . . . to multiwall bags . . . in one contin-

ST REGIS

FOR INDUSTRY!

uous flow! And because fast growing Southern pine is a *crop*—there is no danger of shortage.

The Pensacola development was built for *you!* Day in, day out, it is working to supply you with the multiwalls you need for modern, efficient packaging.

There is a St. Regis sales office near you. Consult them about bag deliveries and for recommendations as to St. Regis packers.

SALES SUBSIDIARY OF SR ST. REGIS PAPER COMPANY

ST. REGIS SALES CORPORATION

230 PARK AVENUE • NEW YORK 17, N. Y.

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Packaging Systems

ATTENTION:
SOUTHERN
INSECTICIDE
DISTRIBUTORS

Westvaco 3-5-40 COTTON DUST

The New Recommended Cotton Insecticide

NOW AVAILABLE FROM NEARBY WAREHOUSE STOCKS

TO HELP OUR SOUTHERN DISTRIBUTORS, Westvaco has spotted ample warehouse stocks throughout the cotton country—instantly available in the quantities required to fill customers' orders.

1948 WILL SEE the first important quantity-use of 3-5-40—the cotton dust recommended by the Southeastern Cotton Insect Control Conference. Field tests under U.S.D.A. supervision show that 3-5-40 provides effective control of Bollworm, Boll Weevil, Pink Bollworm, Cotton Aphid and all other pests common to cotton in the United States. Knockdown is quick—visible to every grower. Three to five dustings are recommended.

TO GET YOUR SHARE of this new June-August business make arrangements NOW to fill in your season needs from our locally warehoused stocks.

WRITE TODAY for location of warehouse stock nearest to you and for details on how you can arrange to draw upon it. Address:

Westvaco CHEMICALS
TRADE - MARK

AGRICULTURAL CHEMICALS DIVISION
WESTVACO CHEMICAL CORPORATION
EXECUTIVE AND GENERAL OFFICES 405 LEXINGTON AVENUE, NEW YORK 17

"VELSICOL 1068"

Chlordane

"VELSY" RIDES AGAIN!

King Cotton Finds a Powerful New Ally

Yes, "VELSICOL 1068" Chlordane has demonstrated that it is sure death to boll weevils, grasshoppers, curculio and other agricultural insects. It also prevents aphid build-up and is effective against such cotton insects as green stink bugs, cotton flea-hoppers and tarnished plant bug. In preventing emergence of a new generation of boll weevils, "VELSICOL 1068" Chlordane reduces the number of applications necessary for sure control of this pest.

Other Velsicol Corporation agricultural products:
AR 50; AR 60; AR 70

Note: "VELSICOL 1068" Chlordane is compatible with dusting sulphur. When red spider is a problem, 40% sulphur is recommended.

Like a marshal of the roarin' bad towns of the old west, "VELSICOL 1068" cleans up in a hurry and has the pesky Boll Weevil on the run pronto. Let this modern nemesis of the evil Boll Weevil ride herd for you. Here's a hard ridin', straight shootin' hombre they don't cotton to, suh! On the square, suh! "VELSICOL 1068" gets 'em "in the square—before they're born, that is, — and so they don't have a chance to harm your crop nohow.

formula

"VELSICOL 1068"	
Chlordane	10%
Inert Carrier	90%
Total	100%

"1068" "VELSICOL" CHLORDANE

VELSICOL Corporation

Manufacturers of: Insect Toxicants • Aromatic Solvents • Resins • Coresin Core Oils

General Offices: 330 East Grand Avenue, Chicago 11, Illinois

Branch Offices: New York • Detroit • Cleveland

Representatives: E. B. Taylor Co., Los Angeles13 • E. M. Walls, San Francisco 11 • J. E. Russell, Houston 11
G. E. Missbach, Atlanta 3 • Natural Products Corp., Montreal

The ODORLESS DAIRY DISINFECTANT

NO-ROMA

For

MILK COOLING TANKS

To control bacteria and mold growth in milk cooling tanks, 1 oz. of NO-ROMA to every 50 gals. of water has proved extremely effective.

A SAVING OF 66% CAN BE EFFECTED BY THE USE OF NO-ROMA RATHER THAN A COMPRESSED QUATERNARY POWDER.

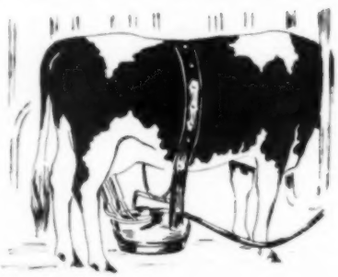
MILK CANS

Before using milk cans, pails and milking utensils rinse well in NO-ROMA solution (1 oz. to 4 gals.) for complete sanitation. No after-rinse is needed.

Baird's
Baird & McGuire
Certified

Serving the Industry for Over 38 Years

MILKING MACHINES



Admirably adapted to the sanitizing of milking machines. Because of NO-ROMA's stability and high bactericidal potency, properly sanitized milking equipment will be relatively free of bacteria. No after-rinse necessary.

For ANY problem of disinfection, odorless NO-ROMA is the answer. Samples and further information on request.

BEFORE YOU BUY DDT AT ANY PRICE

investigate PENTECH

the New Revolutionary DDT

NOW—for the first time—a new type technical DDT, developed and produced exclusively by Pennsalt, is available to the insecticide trade. PENTECH makes it possible for a large number of dust manufacturers and compounders to prepare their finished products without the use of 50% concentrates.

This means lower freight, handling and storage costs. It means reduced production costs . . . with greater profits to you—the manufacturer or the mixer.

For better DDT and other agricultural chemicals look to Pennsalt, a *basic* chemical manufacturer for almost 100 years . . . a leader in research and development. Learn to rely on the experience of your Pennsalt Sales Representative . . . there's one in your neighborhood to serve you.

Get all the facts on this latest Pennsalt development by contacting your nearest Pennsalt sales office. Call, write or wire: Agricultural Chemicals Division, Pennsylvania Salt Manufacturing Company, Philadelphia 7, Pa.; Tacoma, Washington; Bryan, Texas.

PENN SALT
AGRICULTURAL CHEMICALS

OTHER PENCO AGRICULTURAL CHEMICALS

PENCO* DDT DB-50 (Dust Base)
PENCO* DDT WB-50 (Wettable Base)
PENCO* BHC TECHNICAL-36
PENCO* BHC D-12 (Dust Base)
PENCO* BHC W-12 (Wettable Base)
PENCO CALCIUM ARSENATE
PENPHENE* D-40 (Chlorinated Camphene Dust Base — 40%)
PENPHOS (Parathion)
KRYOCIDE* (Natural Cryolite)
PENCO 2,4-D WEED KILLERS
PENITE* 6 WEED KILLER (Sodium Arsenite)

*REG. U. S. PAT. OFF.

Other exclusive Pennsalt agricultural developments include PENCO BHC TECHNICAL-36, the HIGH GAMMA (36%) BHC for manufacturers and PENCO BHC D-12 (12% Gamma Dust Base) for dust compounders.

Founded 1923

THIS year we have completed 25 years of service to the Insecticide Industry.

Starting out as specialists in Pyrethrum and later on in Rotenone products, we have progressed with the great expansion in the Industry that has taken place since the late war.

No industry today is in perhaps a greater state of flux than the Insecticide Industry. New products crowding one on the other create problems that even the scientists have difficulty in solving.

We have earnestly tried to keep pace with this progress and to serve our old and new friends in the same spirit of mutual confidence with which we started out.

Our complete chemical and entomological laboratories have been expanded over the years to maintain the same rigid standard of quality that has always been part of our service.

We thank you sincerely for having made these years possible.

POWCO BRAND
REG. U.S. PAT. OFF.

John Powell & Co., Inc.

ONE PARK AVENUE NEW YORK 16, N. Y.

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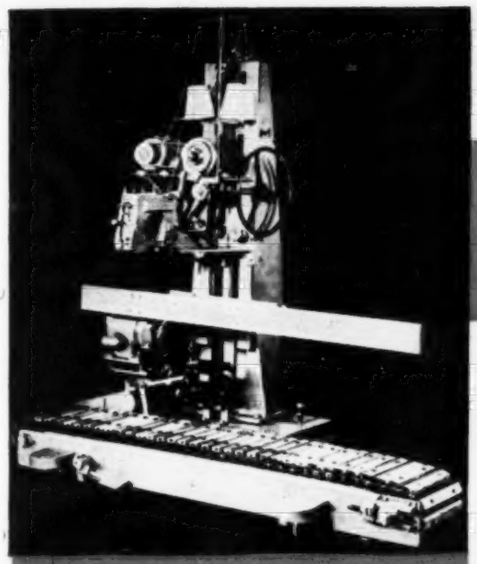

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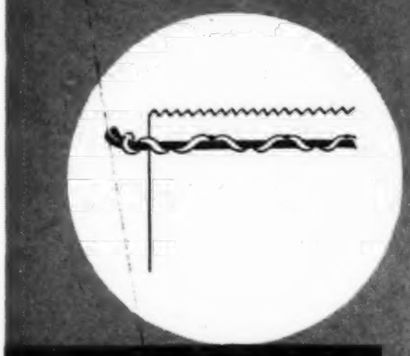

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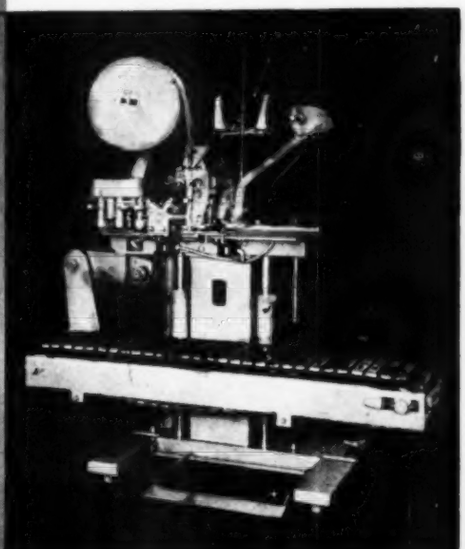

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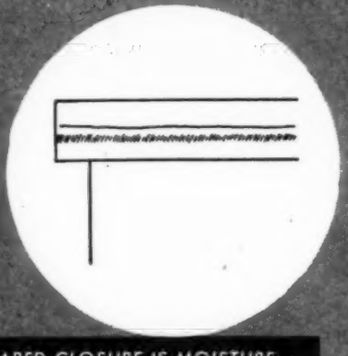

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THE EDITOR COMMENTS

HOW to regulate the use of 2,4-D without restricting its over-all usefulness is the central problem now facing the industry as well as law-makers. At the hearing before the House Agriculture sub-committee in Washington on April 21, representatives of the U. S. Department of Agriculture, of industry, the Civil Aeronautics Authority, and the U. S. Army Chemical Corps discussed HR 452, a resolution to regulate the use of 2,4-D. Congressman Clark W. Thompson, Texas, author of the resolution, summed up his testimony in expressing a hope that legislation on 2,4-D may be avoided, especially state and local prohibitions which would totally deprive farmers of its benefits and would "keep the hoe in business."

However, in the states of Texas and Louisiana understandable wrath is still seething among cotton growers who reported losses totaling a quarter-million dollars last season when 2,4-D dust applied to distant rice fields, drifted onto their property. They want to be assured that there will be no repetition of such acts. Financial responsibility for the damage already done is still being debated.

How far should the federal government go in subjecting the use of 2,4-D to rigid controls? Is it a matter for Congress to decide on a nation-wide scale, or should a model state regulatory law be considered? Who is to regulate the manner in which the weed killer is applied, for instance, the proper technique of airplane application to cut drift of dust to a minimum?

The need for education and more education was reiterated by practically every witness at the Washington hearing. Labels were presented for the record with one typical label being read aloud to the assembly. This warning apparently covered all the hazards involved, including the dangers of drift. Yet the users, many of them, apparently failing to read the warnings, or simply disregarding them, go ahead with dusting programs which allow the potent chemical to get completely out of hand.

Education, rather than inhibitory legislation, is the needful factor as we see it. New fields for use of 2,4-D in agriculture are looming every day with prospects for improved crop yields. Certainly this is not the time for hysterical and unwise legislation to nullify progress already made. Mistakes have been made, but eventually they should well be eliminated by the wide publicity given them. Knowing that 2,4-D is a potent agricultural tool should automatically cause the user to respect it. But industry's job is to let the user *know*.

EXPANSION of Government operations in fertilizer production, ostensibly to meet current heavy world-wide demand, shows a tendency to continue. Supplementing our observations of last month on this same subject, we feel certain that if resistance by the industry and its trade associations were not strong and continuous, inroads of Government into fertilizer manufacture would be far greater than they have been. New proposals for Government fertilizer projects have been too numerous to believe otherwise. And greatly increased world fertilizer needs today offer a very convenient excuse for these new projects.

Because every fertilizer manufacturer is up to his ears taking care of the demand for his own products, he may not as an individual be too fully aware of the steady inroads of Government operations. He may not even be too concerned at the moment. It is something he will attend to later on when he is not so busy. But his industry associations are and have been alive to this threatening trend for some time. They know too well what it may mean to the welfare

of the industry if or when present conditions of active demand, sell-all-you-can-make might reverse themselves.

The whole question of government-in-the-fertilizer-business boils down to the old, old question,—do we have private enterprise in the U.S.A. or is such talk just so much baloney? Why should the Government undertake to make and supply American agriculture with fertilizers? Why not also clothing and shoes for the farmer and his family? Why not tractors, plows, and other equipment? If it's fertilizers today, will it be insecticides, fungicides, and other similar necessities a few years hence? In other words, why fertilizers? And when and where is it going to end,—by putting the fertilizer industry out of business? And then what other industry comes next for the same treatment?

No good reason exists for the Government to continue in fertilizer production when the current post-war world chaos ends. Government plants should then be shut down or turned over to the industry to operate. Not a vestige of an excuse for any other course can be found,—that is if this is still the U.S.A.. And the time to determine that such will be the course is now,—right now, before this Government fertilizer thing gets its hooks in any deeper.

We appreciate that industry leaders are cognizant of the problem, of the threat to the future,—and are fighting government encroachment. But by keeping the spotlight focused on this subject here, we hope also to aid in ending the trend toward socialization of fertilizer manufacture,—and when the emergency is over, a full return of operations to the industry where they belong. And until that is accomplished, we will continue to hammer away in this corner.

PERSONS keeping a watchful eye on trends in agriculture as they influence the use of chemicals, should find encouragement in the fact that farm tenancy is on the decline in the U. S. in favor of farm ownership. Less than 20 years ago nearly half of our farms were operated by tenants. The intervening years have reduced this figure until now only about 30 percent of American farms are operated by tenants; 70 percent by owners. Many ecomomic factors, have contributed to this shift, among them, of course, the high profit from farm produce which has enabled many tenants to buy farms while owners were reducing their own mortgages.

From the standpoint of the fertilizer manufacturer, of the makers of insecticides, fungicides and weed control materials, and others who supply the agricultural market, this is a noteworthy trend. Farm owners with enough business ability to gain possession of valuable land, are usually the ones who appreciate the wisdom of applying modern scientific knowledge to grow better crops on their land. It is far less difficult to "sell" the intelligent land owner on the use of chemical preparations which save labor and at the same time boost yields and profits. The farm owner has a much greater incentive to operate an efficient and profitable business. The trend toward wider farm ownership is of moment to every agricultural chemical supplier.

INTEREST in application equipment appears to be on the increase as many new insecticidal, herbicidal, and fungicidal products come to market. This interest was evident at the recent Mist Blower School sponsored by the Connecticut Tree Protective Association, held at New Haven. Nearly 300 persons attended the event at the Connecticut Agricultural Experiment Station, and heard numerous papers on the subject of pesticide application. Similar events have been held in other parts of the country, too.

Many chemical manufacturers and entomologists have had the feeling that research is moving faster in the field of pesticidal materials than in the mechanical department. It is encouraging therefore, to see the interest in new equipment developments as shown at New Haven and at other recent gatherings around the country. While the emphasis at New Haven was on tree protection, the machines showed adaptability for treatment of all kinds of crops. Development of application equipment is not lagging.

An Evaluation of TOXICANTS For Mosquito Control

By Dr. Joseph M. Ginsburg*

N. J. Agricultural Experiment Station
New Brunswick, New Jersey

DDT is usually the first product to be mentioned in discussions of insecticides for mosquito control, although a number of other new, highly potent insecticides have been developed and tested within the past three years. Of the more promising compounds, DDD (dichloro diphenyl dichloroethane) a close analog of DDT, has been the only insecticide thus far to prove equal to DDT, in its effectiveness in mosquito control. This product is nearly as toxic as DDT to mosquito larvae, but is less injurious than DDT to fish and warm blooded animals.

Of other toxicants, Methoxy-DDT, although less poisonous to warm blooded animals, is more toxic to fish, and shows lower toxicity to mosquito larvae than DDT. "Toxaphene" and chlordane exhibit lower toxicity to mosquito larvae and are more injurious to both fish and warm blooded animals. Parathion, the latest addition to the group of new insecticides, is several times more toxic to mosquitoes than DDT, but less toxic to fish. However, it is more poisonous to warm blooded animals.

In experiments in New Jersey during 1946 and 1947, DDT has been effective both as a larvicide and adulticide. In the former use, its residual application prevented breeding for six weeks or longer in areas not subject to frequent flooding or heavy pollution. Oil containing from 1 to 5 percent DDT in sufficient quantities to deposit 2 to 3 pounds per acre, was used in this case. In catch basins, one application of oil containing about 4 percent DDT remained effective for four weeks or longer, depending on rainfall.

In non-residual application in areas where it is unwise to apply residual dosages, successful results from application of small amounts such as one-half gallon of oil containing 1.5 percent DDT and 0.5 percent spreader per acre. Weekly applications are required since this method does not kill pupae and does not prevent larvae from developing.

As an adulticide, DDT is readily adaptable to newer developments in "fogging" application, and in airplane application. The introduction of the New Jersey Mosquito larva-

* Abstract of paper presented at New Jersey Mosquito Extermination Association meeting. Atlantic City, April 13, 1948.

cide during 1932-35 made possible the first extermination of adult mosquitoes out-of-doors. Recent development of exhaust spray generators which can be installed in motor vehicles and the appearance of commercial "mist blowers," "fogging" machines, etc., has made it possible quickly to disperse DDT from oil solutions and emulsions as a voluminous fine mist or fog over large areas. This offers a new method for exterminating adult mosquitoes on a large scale, including entire communities. It is now in practice in several New Jersey counties.

The degree of success of this method is largely dependent upon such factors as wind velocity; the nature of the fog, whether wet or dry; type of equipment; proper timing; species of mosquito involved, and the nature of the terrain. These variables account for different results, being obtained at various times.

So far as DDT itself is concerned, its greatest contribution to successful mosquito control lies in its property of high residual toxicity. One application may prevent breeding for long periods of time.

Along with its meritorious properties, DDT also has certain disadvantages. Its most serious hazard in mosquito control is the fact that both DDT and to a lesser extent its analog, DDD, are still regarded as cumulative poisons which are injurious to fish, warm blooded animals, and to certain species of plants. The latter is particularly true when the insecticide is incorporated in oil or emulsifiable organic solvents, and may be absorbed by crops.

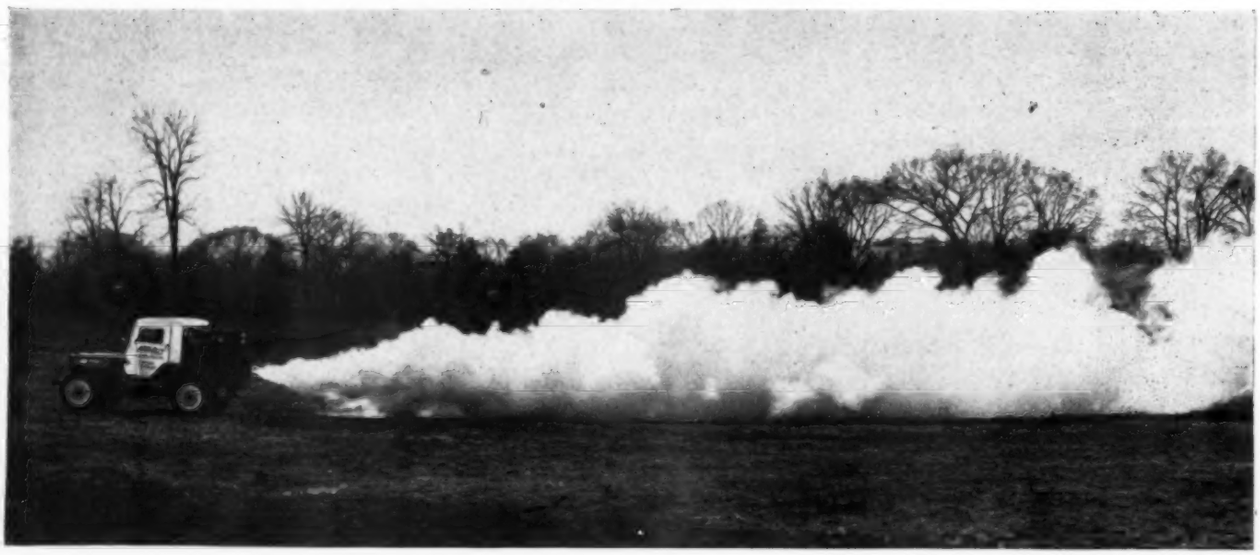
Tests With "Thiophos"

PARATHION, "Thiophos-3422," is one of the latest of new toxicants. To determine its toxicity to the mosquito, the writer used pure parathion in the form of colloidal dilutions in water; oil emulsions, and dusts. These were tested on third instar larvae and pupae of *Aedes Aeqypti* and on goldfish. In the study with larvae, parathion at a concentration of 0.005 ppm in water dilutions, brought 100 percent mortality in a period of 48 hours. Parathion in oil, surface application, produced 100 percent mortality to larvae in 48 hours when applied at the rate of 0.006 pounds per acre. Surface application in dust required a concentration of 0.005 pounds parathion per acre to get 100 percent mortality of larvae in 48 hours. As a comparison, DDT was required in an amount of 0.05 ppm for 100 percent mortality of larvae in 48 hours.

In a study of pupae mortality, parathion caused 100 percent mortality in 24 hours when applied at a concentration of 1.0 ppm in water dilutions. Parathion in oil, surface application, caused 100 percent mortality of pupae in 24 hours at 0.20 pounds per acre. In surface application with dust, parathion brought an LD-50 of pupae in 24 hours when applied at the rate of 0.10 pounds per acre. As a comparison, DDT required a concentration of 25.0 ppm for an LD-50 on pupae in 24 hours; and a concentration of 230 ppm for 100 percent mortality in 24 hours. In five day tests on goldfish, parathion required 1.5 ppm for an LD-50, and 2.0 ppm for 100 percent mortality. DDT took but 0.125 ppm for an LD-50, and 0.25 ppm for 100 percent mortality.

From these results it appears that parathion exhibits higher toxicity to larvae and pupae and is less injurious to goldfish than is DDT. However, further investigations will have to be conducted with this new toxicant under field conditions on several species of mosquitoes and fish as well as studies on its injurious effect to warm blooded animals before its use in mosquito control work may be evaluated fully.

At any rate, DDT is certainly not the last word in new toxicants for the control of insects. Parathion, for instance, may serve as an example of the possibility for new and more toxic chemicals to be developed in the near future which may prove even more potent than DDT for mosquito control work.★★



Typical of fogging operations in control of adult mosquitoes is the TIFA applicator (below) putting out a dense fog of insecticidal material. (Photo courtesy Vogel-Ritt, Inc., Columbus, O.)

Results of Soil Treatment vs Contact Sprays in Corn and Cane

WEED CONTROL

by

A. S. Crafts
Puerto Rico Agricultural Experiment Station

TO control weeds in sugar cane, corn, and similar rank growing crops, there are in theory two contrasting methods that might be used:

(1) A temporary sterilization of the soil to prevent the growth of weed seedlings and protect the crop. This may involve a localized, shallow, topsoil layer, or it might consist of a selective sterilization of a somewhat deeper layer.

(2) A series of contact sprays might be used beginning with a pre-emergence treatment and following through with one or more post-emergence sprays until the crop is ready to lay by. Both of these methods are being investigated and recommendations should soon be available for weed control treatments that will very much reduce the cost and labor of raising these important food crops.

It was pointed out more than 30 years ago by Cates and Cox that the frequent cultivation given corn accomplishes little besides controlling weeds. The theory that cultivation aerates the soil and conserves moisture has been found untenable, and the root pruning considered beneficial by some has been harmful. Many growers have lowered the frequency of tillage in corn, effecting a considerable saving. Few, however, have dreamed of giving up completely the idea of cultivation.

More recently certain growers of irrigated citrus in California, faced with decreasing perviousness of their soils, decided that the soil structure was being destroyed by the frequent tillage practiced in that area. Because of this hazard, they inaugurated programs of non-tillage, substituting chemical sprays to control weeds. Since the adoption of this practice, it has been found that the soils soon become pervious again and that the trees became more thrifty than they were when frequent tillage was practiced. (Parker and Jenny, 1945).

Now comes the proposal that tillage may be abandoned in sugar cane, corn, cotton and all similar crops, with weed control being accomplished by temporary sterilization of the soil or by periodic spraying with contact sprays. While such an inovation should be approached cautiously, it seems certain that chemical weed control has much to offer in relieving the labor of frequent tillage through the growing period of such crops.

As early as 1940, Slade, Templeman, and Sexton (1945) found that alphanaphthylacetic acid at 25 pounds per acre, applied to the soil just after seed-sowing time, prevented germination of charlock, while oats received only a slight set-back. Subsequent tests proved that certain phenoxyacetic and naphthoxyacetic acids were as much as 50 times as effective as the alpha- naphthylacetic acid. From a survey of many such chemicals they selected 4-chloro-2-methyl-phenoxyacetic acid ("Methoxone") as being outstanding, and under the name of "C.L.C." (corn land cleaner) this chemical was used extensively in Britain during the war. They proved that it was effective when used as a soil amendment, applied as a spray, or put on as a dust. One pound per acre proved sufficient as a soil treatment or spray; two pounds were required as a dust. By 1944 they reported on the formative effects of such treatments on weeds, on the range of relative susceptibility found among weeds and crop plants, and stated that the sodium salt "is effective whether absorbed through the root or leaf of the weed." In an

[1] Acknowledgement is made of the co-operation of Mr. A. Emanuelli, assistant agronomist in the P. R. Agricultural Experiment Station, who aided in securing current research referred to in this paper.

accompanying publication Nutman, Thornton, and Quastel (1945) reported the extreme toxicity of 2,4-D in soils to clover and sugar beets and the somewhat lower toxicity to wheat. They also proved that considerable leaching was required to remove the chemical from the soil completely.

Subsequent publications (Crafts, 1946; Allard et al, 1946; De Rose, 1946; Taylor, 1946; Hamner et al, 1946; Marth, 1947; Crafts, 1948; Kries 1947. and Hanks, 1947) have shown that 2,4-D is very toxic in soils, that it can be leached by percolating water, and that it breaks down rapidly in warm moist soils. Experience in California (Crafts, 1946) proves that it may persist in warm, dry soils, or in cool, moist ones, affecting crops planted as much as six months after application.

It is not necessary to describe the tremendous development in the use of 2,4-D as a translocated spray against perennial weeds as a selective spray on annual weeds in cereals, and as a general herbicide to control emergent aquatics, brushy species and weeds of a great variety in the United States and many other countries. The object of this paper is to discuss the use of 2,4-D as a soil amendment to control weeds in sugar cane and corn, and to point out some alternative methods.

The point made by the British workers (Blackman, 1945) that 2,4-D may act through the soil as a selective temporary soil sterilant has far-reaching implications in weed control. If methods could be worked out, it would seem that an application to the soil at seeding time would solve the problem of weeds for the whole season. This would be important enough in small grains, but in a crop like corn, considering the role of tillage mentioned earlier, it would be revolutionary.

2,4-D in Soils

ON the other side, California farmers have experienced many serious effects of 2,4-D residues in soils (Crafts, 1946). Tests on toxicity and leaching of 2,4-D in California (Crafts, 1948b) prove that while it can be leached out, much water is required. Breakdown of small quantities is rapid but larger quantities persist for longer periods.

Furthermore, tests on the germination and growth of seedlings of some 200 varieties of vegetable and field crops on filter pads moistened with 2,4-D solutions have shown that there is no sudden break in the curve representing susceptibility of different plant species to this material. Although corn and the small cereals occupied most of the top positions, representing low susceptibility, there was considerable spread among those species and varieties of the grass family and several broad-leafed species occupied positions above some of the graminaceous crops.

Field experience bears out the wide differences in susceptibility of both crops and weeds and indicates that weedy grasses and a number of broad-leafed weeds are not subject to control at concentrations of 2,4-D commonly used. On the other hand plot experiments and commercial application of 2,4-D salts have resulted in injury to small grains where conditions and dosages were such that the chemical was brought into direct contact with the roots of the crop at an early stage of development. (Harvey and Robbins, 1947). These observations indicate that the margin of selectivity between crop plants and weeds may be small, and particularly in the case of treatment through the soil may be too narrow to provide a safe method.

Below: Practically weed-free corn plots which received combination fortified oil emulsion sprayed with 2,4-D. These plots were sprayed three times, and need no tillage at all.

Pre-Emergence Treatment

RECENTLY two papers have described a pre-emergence treatment for control of weeds in corn with 2,4-D (Anderson and Wolf, 1947; Anderson and Ahlgren, 1947). Using 2.7 pounds of 2,4-D per acre, Anderson and Wolf found that "annual grasses as well as broad-leafed weeds were effectively controlled for about 6 weeks." They conclude "The total yields from each treated strip indicate that 2.7 pounds of 2,4-D effectively controls weeds and does not have any detrimental effect on corn production."

Considering the acreage of corn grown in the United States each year these results are of eminent importance. If as Anderson and Ahlgren state "corn growing without cultivation appears to be a real possibility," this finding will be an outstanding achievement in the progress of scientific agriculture.

In presenting this paper the author does not wish to detract in any way from the results of these New Jersey experiments. From several years experience in pre-emergence treatments, however, some of the pitfalls that are possible in this method, should be pointed out to

avoid possible unwise exploitation until sufficient work has been done to prove the method safe. Should there be conditions under which use of 2,4-D may prove hazardous, an alternative method is suggested. Although more laborious, the alternate method may prove widely useful.

In the early summer of 1943 a field of recently planted onions in the Tule Lake section of California was given a pre-emergence spray with "Sinox" (sodium dinitro ortho cresylate). No rain fell for several weeks; the onions came up and made a fine crop. In the winter of 1943-44 a similar planting of onions in the Sacramento river delta was pre-emergence sprayed with "Sinox." There followed several weeks of moist drizzly weather. The "Sinox" remained in solution in the shallow topsoil surface and the onions were so severely injured that they had to be plowed up and replanted. These results were replicated in plot tests and it was proved that water-soluble contact toxicants were too hazardous to use in pre-emergence spraying in certain vegetable crops. These results were reported (Crafts and Raynor 1944) and diesel oil and fortified diesel oil were recommended for pre emergence work.

In the experiments at New Jersey (Anderson and Wolf, 1946) a total of one inch of rain fell during the first week after the 2,4-D application. From our knowledge of 2,4-D in soils, and the fact that enough 2,4-D was used to control annual grasses, it seems reasonably certain that if less rain had fallen, the chemical might have been concentrated in the shallow soil layer in which the corn seedlings were developing, causing more injury to the corn; and had more rain fallen the chemical might have been leached so deeply that the weeds would have survived. In short, pre-emergence treatments using chemicals that act through the soil are extremely subject to vagaries of the weather. Working upon so narrow a margin of selectivity as that between annual grasses and corn, it seems possible that serious mishaps might occasionally occur. In California, vegetable seed growers, believing the label's statement that the material "Will not sterilize the soil," sprayed wild morning glory in their propagating fields and later disced them up and planted breeding stocks for increase. At least one breeder lost some valuable stock of vegetable seed. It would be unfortunate if hybrid corn breeders would have similar experience through lack of knowledge of the properties of 2,4-D in soils. That the New Jersey workers are fully aware of this hazard is indicated by the Editor's Note preceeding their second article (Anderson and Ahlgren, 1947).

Analyzing the situation with respect to weather it seems that there are four rather distinct conditions that might affect a pre-emergence treatment designed to act through the soil. (1) No rainfall following the application. (2) Light rainfall or foggy weather. (3) Moderate rainfall. (4) Heavy rainfall or flood. Condition (1) would result in failure under most conditions because the chemical would not get into the soil surrounding the roots of the weeds. Condition (2) might cause serious injury to the crop plants[2] because of high concentration of the chemical in the shallow topsoil layer. Big robust plants like corn, cane, soybeans, etc. would be less subject to this injury than onions, carrots, lettuce, etc. Condition (3) is the most favorable for successful selective action and should result in control of the weeds. Condition (4) may result in failure for if the chemical is leached from the soil, weed seedlings will survive.[3] Textural grade of the soil will affect the results, leaching being more pronounced in sandy soils.

Recent tests using 2,4-D acid applied dry and the sodium salt of 2,4-D applied in solution, prove that the acid is more effective during rainy weather. One month after application during which 3.72 inches of rain fell, 6 and 8 pounds of 2,4-D acid per acre have kept practically all weeds under control. Equivalent amounts of sodium salts were evidently leached from the soil, for weeds on the sodium salt plots developed nearly as vigorously as on the control plots. A possible safeguard against wide differences in rainfall would be the use of a combination of both 2,4-D acid and the sodium salt. Mixed half and half, these two would be effective under a wide range of rainfall variation. Dry application of the chemicals would be most economical.

One further requirement for successful pre-emergence treatment through the soil is a smooth well prepared seed bed. Rough cloddy land cannot be treated in such a way that

(*Turn to Page* 81)

[2] Since this article went to press, a report on the 1947 tests in New Jersey describes injury to corn seedlings in sandy soil from pre-emergence treatments with 2,4-D. (*Down to Earth* 3:13. Spring, 1948).

[3] The report mentioned above states that grasses and red-root pigweed survived on plots treated on the day of planting that received 2½ inches of rain between the second and seventh day.

Much additional information needed on how 2, 4-D affects soil and planted seed in treated fields. . . . Amount of rainfall makes significant difference in effect of herbicide both on crop plants and on weeds to be killed..leaching a problem.

—*Photo courtesy Coke Oven Ammonia Research Bureau, Columbus, O.*

MONIUM ULFATE

REQUIREMENTS of mixed fertilizer producers have to a great extent determined the direction of improvements in quality which producers of by-product ammonium sulfate have attempted to follow. The demands of the mixed fertilizer trade are that the product shall be free from lumps or cyrstals of excessive size, and that it shall retain its free-flowing properties until it is mixed.

In meeting the demands of the fertilizer mixer in ammonium sulfate quality, the producer of the by-product salt has had to make wide revisions in process and in equipment. As a result of these changes, improvements have resulted which it is stated give a by-product ammonium sulfate with qualities which equal or surpass those of the salt made synthetically, and which has physical properties equal to or better than those of fertilizer materials other than ammonium sulfate[1].

In the production of mixed fertilizer, chemical reaction between the components of a mixture may induce lumping through caking. As is known, this is the case when superphosphate is mixed with ammonium sulfate. Common practice, therefore, is to mix the superphosphate and the ammonium sulfate in advance of adding other components to permit the reaction to complete itself. This completed mixture is then milled and mixed with the other components of the finished fertilizer. This has been indicated by Adams and Ross.[2]

In the preparation of mixed fertilizers, for which about seventy percent of the ammonium sulfate is used in the United States, it is thus noted that the by-product sulfate ends up in the finished fertlizer as part of entirely different chemical compounds. The crystal size of the ammonium sulfate before mixing plays no part in the caking of the fertilizer after the mixing and curing operations. One of the reaction products of the ammonium sulfate actually conditions the fertilizer after the curing step. The objects, therefore, are to keep the product free-flowing until it is mixed, and at the same time to keep the crystal size small enough so that the rate of the chemical reactions which take place during the mixing process are not unduly retarded.

Improved Crystal Size

FOR the past twenty years, studies both in Europe and in the United States have been conducted toward improvement in the quality of ammonium sulfate, particularly crystal size and free flowing characteristics. Imports of sulfate with improved crystal quality for Europe in the late thirties stimulated investigations in the U.S. as did the inauguration of synthetic sulfate of improved quality in Canada. Since that time, the American trend has been toward a free-flowing product but without the customary crystal size grading as is practiced in Europe.

Since 1940, new processes have been designed to improve crystal quality of ammonium sulfate, to reduce operating costs in reclaiming ammonia from coking gases, and to give greater efficiency in general by-product sulfate production. After several years of test work by the Koppers Company, a new process was placed in operation early in 1945. Without going into the technical details of the method, it is sufficient to state that by equipment redesign and by variations in the rate and type of circulation of the ammonia absorbing liquor, greater efficiency in gas absorption and closer control of crystal size has been obtained.

In connection with studies on equipment and methods in by-product ammonium sulfate production, Koppers has also investigated the factors governing the caking of the salt in the belief that more knowledge is needed of the relationship between crystal size and free flowing properties. This work has provided data to show that the caking tendency is affected appreciably by crystal size in the size range from the opening of a No. 100 up to that of a No. 10 U. S. Standard sieve. The caking tendency of ammonium sulfate of any given crystal size is also affected appreciably by moisture and free acid concentrations. There seems to be no caking tendency for the salt of crystal size corresponding to the opening of a No. 30 U. S. Standard sieve, or larger, so long as the moisture and free acid contents of the salt are held

[1] **Based chiefly on information obtained from E. V. Schulte, Koppers Co., Pittsburgh.**

[2] **Adams & Ross, Ind. & Eng. Chem., Vol. 33, No. 1, pg. 121.**

Table I—Screen Tests—U. S. Standard Sieve Series

	Small	Medium	Large
Per cent on No. 10	0.0	0.0	0.3
Per cent on No. 20	2.1	25.5	45.0
Per cent on No. 30	30.3	65.0	77.0
Per cent on No. 40	75.5	87.7	91.1
Per cent on No. 60	95.8	98.8	98.5
Per cent on No. 70	97.8	99.7	99.7
Per cent on No. 80	99.0	99.9	99.9

within limits which can be easily met in practice.

The requirements of the mixing trade apply also to ammonium sulfate for direct application to the soil although the crystal size may be a little larger in this case so long as it is not so large that uniform distribution is impaired in drilling operations.

Larger Crystals Unsuitable

THAU[3] states that during the earlier stages of development in Europe the producers went too far in their attempt to enlarge the crystal size. Finally the consumers explained that the larger crystals did not distribute uniformly when applied unmixed to the soil. For this reason a clause was added to the specifications limiting the grain or crystal size to 4.0 millimeters for either Grade I or Grade II sulfate. 4.0 millimeters is equivalent to 0.158 inches or between 1/8 and 3/16 of an inch. The size cited in these specifications doubtless refers to the minimum dimensions, and lengths greater than 4.0 millimeters would probably be tolerated provided the ratio of length to diameter of the larger crystals was not excessive.

A representative of a plant producing synthetic ammonium sulfate in Belgium stated recently that experience had shown that the ideal crystal for direct application to the soil was one with a length of about 1.2 millimeters. Crystals with a length-to-width ratio of about two to one were usually produced. The width of such a crystal corresponds to the opening of a No. 30 U. S. Standard sieve. Mehring and Cumings[4] concluded after extensive test work, that the ideal size for a fertilizer was about 20-mesh, and that particles larger than 10 mesh were too large for thorough incorporation with the soil. They added that good results in distribution should be obtained when the diameters of the particles do not exceed 1 millimeter nor fall below 0.2 millimeter.

The one point common to either saturators or crystallizers using the liquor circulation and classification principle is that the ratio of length to diameter increases as the weight of the crystal increases. For example, it is not uncommon to see crystals as long as 6.0 to 8.0 millimeters in a sample which contains 80 per cent or more on a No. 30 U. S. Standard sieve. In this case the ratio of length to diameter of the larger crystals might be as much as four or five to one. In smaller crystals the trend is always toward a ratio of one to one which is, however, hardly ever attained in practice. The ratio of length to diameter is held down reasonably well as long as the crystals are retained in circulation. It increases as the crystals grow while in suspension and not in circulation. Chemicals can be added to the bath to retard the elongation of the crystal but this, of course, complicates the operation and is not desirable when it can be satisfactorily avoided by other means.

Fertilizer Needs Can be Met

THE demands are therefore for a free-flowing salt for a fertilizer either in mixed or unmixed form. The experiences demonstrate rather conclusively that these demands will be satisfied, with safety, by working toward the production of a uniformly-sized, dry neutral salt containing between 50 and 75 per cent by weight of crystals on a No. 30 U. S. Standard sieve. This is a confirmation of findings and conclusions previously reported by H. G. Guy of the Research Department of the Koppers Company, Inc., at the February, 1944, meeting of The Eastern States Blast Furnace and Coke Oven Association.

The crystal sizes cited in the foregoing are produced with ease in the new Koppers process.[1] Table I shows typical screen-analyses of crystals continuously produced during repeated runs. The analyses given are

(*Turn to Page 78*)

Table II—Hygroscopic Points of Various Fertilizer Salts

Fertilizer Salts	—Relative Humidity at— 68°F. Per cent	86° F. Per cent
Calcium Nitrate	54.8	46.5
Ammonium Nitrate	63.3	59.4
Sodium Nitrate	74.5	73.7
Urea	80.7	75.2
Ammonium Chloride	79.2	77.5
Ammonium Sulfate	81.0	81.1
Diammonium Phosphate	83.2	82.8
Potassium Chloride	85.3	84.4
Mono Ammonium Phosphate	93.1	92.9
Mono Potassium Phosphate	93.2	93.0
Potassium Nitrate	94.5	93.3
Potassium Sulfate	97.0	96.5

[3] A. Thau, Oel und Kohle, No. 9, pg. 240-256, Mar., 1943.

[4] A. L. Mehring and G. A. Cumings, USDA Tech. Bulletin No. 182.

Experiments to Control Curculio with

Benzene Hexachloride

USE of benzene hexachloride for the control of plum curculio was first observed by the writer in the late summer of 1945, when a commercial entomologist had used a block of peach trees in Burlington County, N. J. to test the BHC. The BHC formulation was to be tested as a control for curculio as compared with standard lead arsenate-zinc sulfate-lime treatment. At that time, the most noticable difference was in the condition of trees. Those sprayed with BHC showed no injury of foliage, fruit, or twig; but trees treated with lead arsenate showed the usual leaf spotting, yellowing and loss of leaves together with twig cankering due to arsenical injury.

BHC Experiments in '46

THREE formulations of benzene hexachloride, one from each of three insecticide manufacturers, were used by the senior writer for field testing in 1946. These three formulations varied in their content of benzene hexachloride, and also in the percentage of the gamma isomer. The three were tested in 1946 in two different orchards on three varieties of peaches in comparison with the standard lead arsenate-lime and lead arsenate-zinc sulfate-lime schedules. Each formulation was used at a dosage that would give the same gamma isomer content in 100 gallons of spray.

The results in 1946, as far as curculio control was concerned, was determined by collecting dropped peaches from a number of trees in each plot at weekly intervals following the spray treatments. The dropped peaches were cut to determine those that were wormy and those that were clean. The data were expressed as wormy drops per tree during the period of 4 to 6 weeks, the drops being collected following spray applications. Such applications were made at the shuck split stage, ten days after the shuck split and, in some cases, a third spray was applied ten days after the second. Observations were made also on the condition of the foliage following the different treatments. Table 1 sets forth data from one of the field tests run in 1946.

TABLE 1

Number of curculio wormy drops per tree on plots sprayed with benzene hexachloride compared to plots sprayed with acid lead arsenate.

Treatment	Wormy Drops per Tree 5/31 to 6/25
Brand "A" B.H.C. 2 sprays	196
Brand "A" B.H.C. 3 sprays	53
L.A.-lime 2 sprays	307
L.A.-lime 3 sprays	237
Brand "B" B.H.C. 2 sprays	427
Brand "B" B.H.C. 3 sprays	231
L.A.-$ZnSO_4$-lime 2 sprays	406
L.A.-$ZnSO_4$-lime 3 sprays	225
Brand "C" B.H.C. 2 sprays	259
Brand "C" B.H.C. 3 sprays	164

The data in table 1 show that three sprays spaced 10 days apart and beginning at the shuck split stage of peach development were more effective in reducing curculio injury than two sprays. The data also show that two of the three formulations of BHC were more effective than the standard lead arsenate treatments in reducing the number of wormy drops per tree.

In all of the plot treatments the benzene hexachloride, regardless of the formulation used, showed no foliage or twig injury. On the lead arsenate sprayed trees varying amounts of foliage and twig injury appeared following the lead arsenate treatments.

During the 1946 season it was assumed that the principal effect of the benzene hexachloride was to kill the adult curculio. An attempt was made to prove this in 1946 by collecting bouquets of peach branches freshly sprayed with BHC and others freshly sprayed with lead arsenate-lime. These were placed in wire screen cages in an outdoor insectary and curculio adults from unsprayed trees placed in the cages. It was observed that the adult curculio fed upon and deposited eggs readily in the young peaches sprayed with lead arsenate-lime. The adult curculio in the cages containing the BHC sprayed-fruit and foliage refused to feed and remained for days on the floor of the cage as far removed from the sprayed fruit and foliage as possible. This indicated a repellent action of the BHC to the adult curculio. No experiments were run in 1946 to determine if BHC killed adult curculio by contact. Neither were any experiments run that season to determine if BHC killed the immature stages in the peaches. As will be shown in the 1947 experiments, benzene hexachloride appears to act principally in killing the immature stages in the peaches before or after they fall from the tree.

BHC Experiments in 1947

THE writers began working together during the 1947 season in testing benzene hexachloride as a control for curculio on peaches. Equipment and manpower were pooled and the experiments were run as a joint undertaking, each having access to all data and observations.

In planning the experiments,

by

B. F. Driggers
and
M. M. Darley

New Jersey Agricultural Experiment Station and General Chemical Corporation, respectively.

Results of Benzene Hexachloride experiments in 1946 and 1947 are tabulated . . . BHC formulation compared with standard lead arsenate-zinc sulfate-lime treatment for control of plum curculio. . . . How problems were solved.

it was decided to obtain data on the following points: (1) relative effectiveness of several brands of benzene hexachloride being offered for sale (four brands were chosen); (2) relative effectiveness of five, seven and ten-day intervals of spray applications, using one brand; (3) relative effectiveness of the four brands at the same dosage in comparison with the standard lead arsenate schedule on a 10-day schedule; (4) different dosages of BHC of one brand on a 10-day schedule; and (5) effect of adding zinc sulfate-lime on benzene hexachloride.

The above program required eleven different spray programs or plot treatments. It was decided to use two-tree plots, replicated seven times, which gave a total of 154 trees in the experimental set-up which covered a ten acre block of four-year-old trees. All of the trees of the variety Triogem were used to lay out the plots. A severe curculio problem was anticipated and was realized in this orchard. The orchard is surrounded on all sides by woods, grass fields, and abandoned orchards, making ideal situations for curculio to overwinter. Furthermore, the light crop of 1946 was not sprayed for curculio.

The basic schedule decided upon was a shuck split followed by two cover sprays at ten-day intervals. For several weeks prior to shuck split the weather was cool with frequent rains. The shuck split spray was applied on all plots on May 13th. The day following the shuck spray it turned quite warm resulting in rapid peach growth and heavy emergence of curculio. The originally planned schedules were adhered to even though it appeared at the time that curculio were going to destroy a high percentage of the crop, especially on the BHC treated trees.

The eleven spray programs used and the dates of spray applications are set forth in table 2 . Spray treatments 12 to 16 inclusive were added after the grower had applied the first or shuck split spray of lead arsenate for the purpose of testing two spreader and deposit building materials and a new experimental formulation of benzene hexachloride. Wormy drops began falling about the time the second or 10-day after shuck split spray was applied on May 23. During this period and until the last week in June three separate collections of drops were made on each tree in each plot and the number of wormy and clean fruits determined. A fourth collection of drops was made about the middle of July after the grower had completed thinning the fruit. The results from these several examinations of dropped and thinned fruit are set forth in table 3.

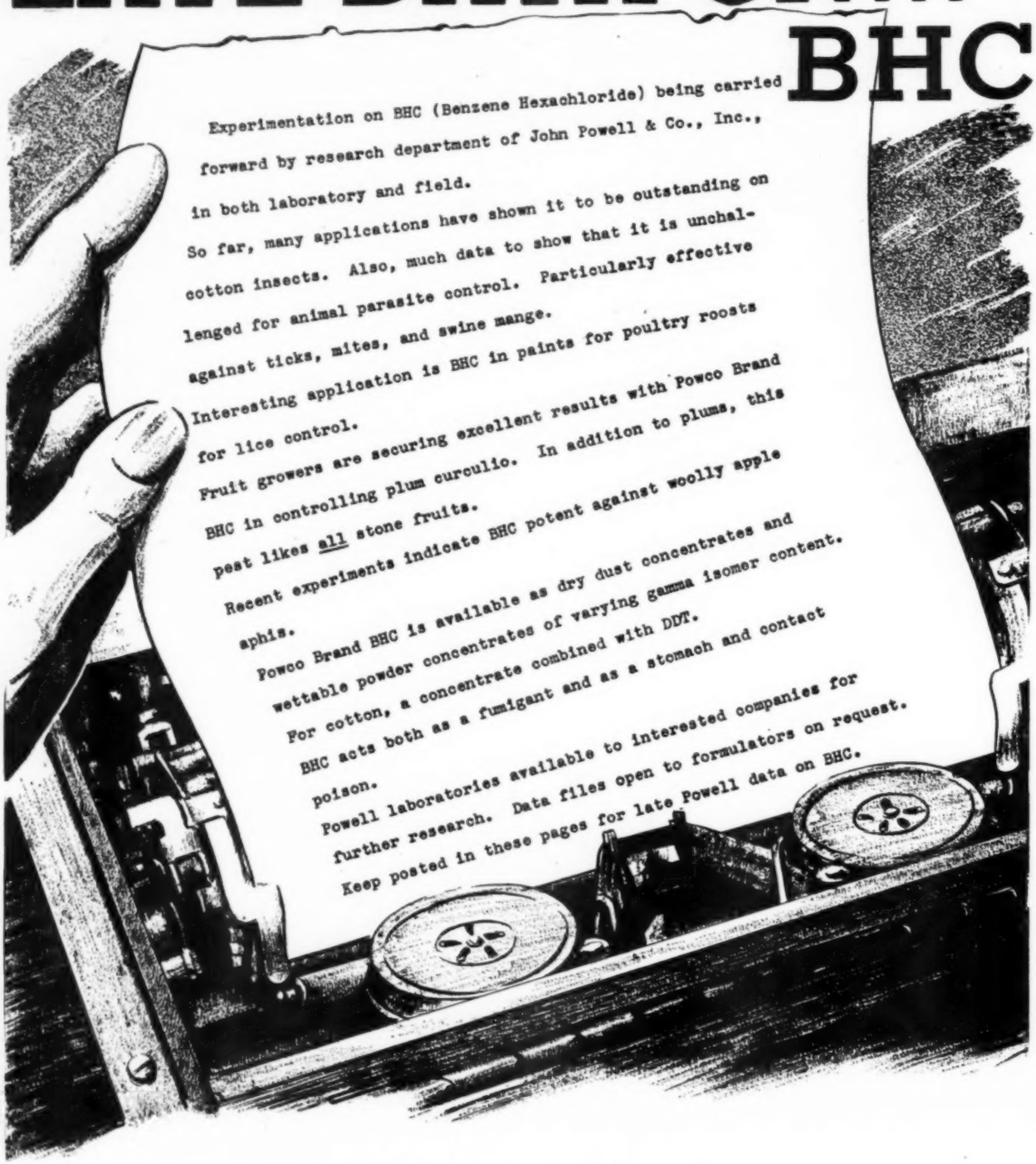
The most striking thing brought out by the data in table 3 is the wide difference in wormy drops per tree on the benzene hexachloride treatments as compared to the two standard acid lead arsenate treatments. Up to and including the June 24th collection one of the lead arsenate treatments averaged 249 wormy drops per tree and the other 278 wormy drops per tree. The poorest BHC treatment averaged only 28.6 wormy

TABLE 2

Spray programs of B.H.C. used in comparison with lead arsenate and dates of spray applications.

Program No.	Materials and Dosage 100 Gallons (Wettable sulfur 4# added to each)	Spray Dates (Shuck Split 5/13)
1	Brand "A" B.H.C. 3#	5/13, 5/23, 6/2
2	Brand "A" B.H.C. 2#	5/13, 5/18, 5/23, 5/28, 6/2
3	L.A. 2#, lime 16#	5/13, 5/23, 6/2
4	Brand "B" B.H.C. 2#	5/13, 5/23, 6/2
5	Brand "A" B.H.C. 2#	5/13, 5/23, 6/2
6	Brand "A" B.H.C. 2#, lime 12#, monohydrated zinc sulfate 5½#	5/13, 5/23, 6/2
7	Brand "A" B.H.C. 1½#	5/13, 5/23, 6/2
8	Brand "C" B.H.C. 2#	5/13, 5/23, 6/2
9	Brand "A" B.H.C. 2#	5/13, 5/20, 5/28
10	L.A. 2#, lime 12#, $ZnSO_4$ 5½#	
11	Brand "D" B.H.C. 2#	5/13, 5/23, 6/2
	Following growers' use of lead arsenate-sulfur-lime in shuck split 5/12	
12	Brand "A" B.H.C. 2#	5/23, 6/2
13	Brand "B" B.H.C. 2#, Orthex 1 pt.	5/23, 6/2
14	Brand "A" 2#, colloidal Z-1¼#	5/23, 6/2
15	Experimental B.H.C. (20%) 5#	5/23, 6/2
16	Brand "B" B.H.C. 2#	5/23, 6/2

LATE DATA ON... BHC



Experimentation on BHC (Benzene Hexachloride) being carried forward by research department of John Powell & Co., Inc., in both laboratory and field.

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Fruit growers are securing excellent results with Powco Brand BHC in controlling plum curculio. In addition to plums, this pest likes all stone fruits.

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TABLE 3

Dropped and thinned peaches and number curculio wormy per tree.

Treatment No.	6/4		6/12		6/24		Totals to 6/24		7/15	
	No.	Wormy	No.	Wormy	No.	Wormy	No.	Wormy	No.	Wormy
1	3.3	0.6	7.6	1.4	24.4	2.2	35.3	4.2	297	39.3
2	2.5	0.4	7.9	0.7	16.1	1.7	26.5	2.8	293	45.6
3	106.6	104.1	145.5	139.6	47.8	34.1	299.9	277.8	62	20.6
4	3.6	1.4	15.4	5.4	36.8	4.6	55.8	11.4	257	45.1
5	4.0	0.6	12.1	2.6	35.5	5.0	51.6	8.2	288	47.5
6	2.4	1.0	11.4	4.4	25.6	4.1	39.4	9.5	240	28.6
7	9.1	4.6	27.2	12.7	52.0	11.3	88.3	28.6	224	54.1
8	4.1	1.5	18.5	6.7	38.4	8.9	61.0	17.1	269	54.1
9	1.4	0.4	15.6	5.4	33.0	11.3	50.0	17.1	259	94.4
10	103.5	100.8	126.5	118.5	50.6	29.9	280.6	249.2	79	20.6
11	6.2	3.2	31.2	13.8	45.2	8.5	82.6	25.5	235	61.2
12	5.3	4.4	20.9	11.6	24.7	8.4	50.9	24.4	90	24.7
13	4.9	2.7	18.2	11.0	22.9	4.9	46.0	18.6	153	23.3
14	4.0	1.9	12.4	7.4	17.7	2.6	34.1	11.9	149	12.3
15	5.9	3.4	19.3	12.9	11.9	2.0	37.1	18.3	137	4.4
16	6.4	4.6	30.4	19.1	32.3	9.4	69.0	33.1	165	30.0

drops per tree whereas the best BHC treatment averaged 2.8 drops per tree.

The data in table 3 can be analyzed and studied from several angles. If the four brands are taken at the same dosage of 2 pounds to 100 gallons and three spray applications at 10-day intervals, it was found that the best of the four averaged 8.2 worms per tree through June 24th with the other three averaging 11.4, 17.1 and 25.5 respectively. The two lead arsenate treatments averaged 277.8 and 249.2 wormy drops per tree respectively.

The importance of the intervals between sprays is brought out by the data in table 3. Plot 2 received 5 sprays of 2# of Brand "A" BHC at 5-day intervals from May 2 to June 2. The average wormy drops per tree through June 24 was 2.8. Plot 9 received 3 sprays of 2# of Brand "A" at 7-day intervals from May 13 to May 28 and averaged 17.1 wormy drops per tree. Plot 5 also received 3 sprays the same as plot 9, but at 10-day intervals instead of 7-day intervals, and averaged 8.2 wormy drops per tree. The two lead arsenate treatments (plots 3 and 10) averaged 277.8 and 249.2 worms per tree respectively.

A comparison of different dosages of benzene hexachloride is brought out by the data in table 3 for plots 1, 5 and 7. On these plots brand "A" was used at 3, 2 and 1½ pounds per 100 gallons in 3 sprays at 10-day intervals. The 3 pound dosage gave 4.2 wormy drops per tree, the 2 pound dosage 8.2 and the 1½ pound dosage gave 28.6 wormy drops per tree. Regardless of the dosage, however, the wormy drops per tree were far below the wormy drops per tree recorded for the lead arsenate teatments.

The addition of zinc sulfate-lime to the benzene hexachloride appeared to have little if any effect one way or the other. The wormy drops per tree without the zinc sulfate-lime was 8.2; with the zinc sulfate-lime it was 9.5. The difference was not significant.

A laboratory study was made of the four brands of benzene hexachloride to see if any chemical or physical differences could be detected that would account for the differences in curculio control observed. This phase of the work was done in the laboratories of the General Chemical Company. The amount of gamma isomer present in each sample was determined and the relative particle size. These data, in comparison with wormy drops per tree, are set forth in table 4.

The data in table 4 show that the brand "A" which had the highest gamma isomer content and also showed fine particle size was the most effective in preventing wormy drops. Brand "C" which had the lowest gamma isomer content showed up with the finest particle size which offset in all probability the lower gamma content.

After the plot treatments (table 2) had reached the point where the second or 10-day-after-shuck split spray was due it was found that benzene hexachloride at the dosages being used (2 to 3 pounds containing approximately 6% gamma isomer) was not killing a high percentage of adult curculio. This was determined by placing sheets under the trees before spraying and collecting adult curculio from the sheets immediately after spraying and for several days thereafter. The collected curculio were placed in cages and observed over a period of a week. Less than 25% of the beetles were killed with any brand or any dosage up to 3 pounds to 100 gallons.

A second series of plots was then laid out adjoining the first series to test two wetting and deposit building products. Included in the new set of plots was a new formulation of benzene hexachloride containing 20% benzene hexachloride which was used at 5 pounds to 100 gallons of water. The trees where the new series of plots were laid out had been sprayed at the shuck split on May 12 by the grower using lead arsenate-lime. The plots were sprayed on May 23 and June 2 thereafter with the new treatments. The results, shown in table 2, plots 12 to 16 inclusive, show that both Orthex and colloidal Z-1 improved the control of curculio. The addition of the deposit builders cut the wormy drops per tree in half. The experimental formulation of benzene hexachloride carrying 20% BHC and used at 5 pounds to 100 gallons

(*Turn to Page 76*)

TABLE 4

Wormy drops per tree as related to gamma isomer content and particle size.

Plot No.	Brand of B.H.C.	Percentage in Powder			Drops through 6/24	
		Gamma Isomer	On 100 Mesh	Through 325 Mesh	No.	Wormy
5	A	7.0	1.7	90.9	51.6	8.2
4	B	6.3	5.7	76.3	55.8	11.4
8	C	5.6	0.4	96.0	61.0	17.1
11	D	6.2	8.2	80.9	82.6	25.5

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Field Tests of Fruit Trees for

Micro-Nutrient Deficiencies

by

C. Emlen Scott

Extension Specialist in Plant Pathology
University of California, Berkeley, Calif.

Part II

This article is a sequel to "Minute Amounts of Minor Elements Essential in addition to Regular Fertilizer," by D. R. Hoagland, which appeared in April Agricultural Chemicals.

MICRO-NUTRIENT problems have been experienced by the writer chiefly with deciduous fruits and nuts in northern and central California. Of the five micro-nutrient elements now generally recognized to be essential for plant growth, four are known to be deficient in various parts of the state. Molybdenum deficiency has not been recognized here in the field, and has not been generally included in the exploratory tests.

Boron, manganese and zinc are now used by fruit growers in certain areas with very definite results. Copper response has been clearly demonstrated in apple, pear, prune and walnut in several small areas. Experience with commercial applications of copper is rather limited as the affected areas are small or the affected trees are unthrifty for reasons other than such deficiencies.

With very few exceptions, recommendations for commercial use of these elements are based on reduction or elimination of symptoms which are quite specific for the element concerned. Plants suffering from such deficiencies are really diseased rather than being merely unthrifty. The plant pathologist is much concerned with these troubles because the symptoms so often resemble a virus disease or insect or other injuries. Increased fruiting is occasionally secured with the almond and some varieties of grape where foliage symptoms are not detectable. Such response is seen only in plants on soils where other kinds of trees or vines will show good foliage symptoms. Generally, however, no measurable response is secured from applying a micro-nutrient element, unless recognizable symptoms are evident in the plant.

Susceptibility Differs

DIFFERENT species of fruits and even varieties differ greatly in their susceptibility to shortages of these elements. It is evident that the different kinds of plants either have different requirements or else differ in their ability to secure the element from the soil. The various kinds of trees also differ in their ability to obtain the element with different methods of application. This is particularly true of zinc deficiency with which at least four methods of application are in use, each suited to certain kinds of plants.

Although more than one deficiency often occurs in the same

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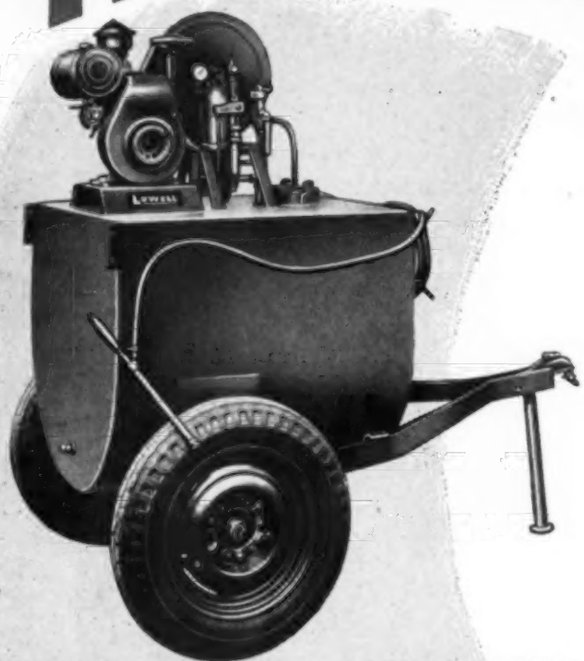

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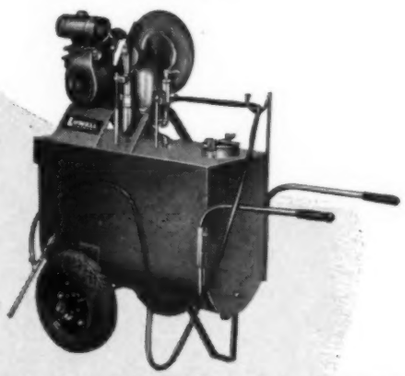
Lowell SprayCat Model 6415—Compactly designed. Shown, 100 gal. model, either 2 or 4 g.p.m. discharge, 25 ft. ⅜" oil and chemical-proof spray hose. No. 6060 single-nozzle adjustable spray gun. Also 50 or 30 gal. models with 2 g.p.m. discharge.



Lowell SprayCat Model 6255—Easy to handle; easy to store. Automotive-type, pneumatic-tired wheels don't sink in soil or cut sod. In 50 or 30 gal. models with 2 or 4 g.p.m. discharge, 25 ft. ⅜" oil and chemical-proof spray hose. No. 6060 single-nozzle adjustable spray gun.

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Note: All SprayCat Power Sprayers can be fitted with Lowell 11 and 20 foot booms for speedy, large coverage.

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Requirements of minor elements differ in various species and varieties of fruits. . . . plants also differ in ability to secure element from soil. Accurate testing for deficiencies made by inserting chemicals in limbs to contact sapwood and heartwood.

district, sometimes in the same tree, they usually can be diagnosed accurately from leaf, bark or fruit symptons. At times such diagnoses may require a considerable amount of discernment. Individual leaves from iron, manganese and zinc deficient trees may appear to be much alike, but the distribution of affected leaves on the shoot or their size and shape usually tells the story. It is often very desirable to have a simple test to confirm a diagnosis or to explore for a deficiency in suspected cases. A number of testing methods have been devised but the use of limb injections with dry salts of these elements has proven to be very dependable for deciduous fruit trees. By making such tests in single limbs the balance of the tree is available for comparison. If more than one element is to be tested, the others can often be placed in the same tree. This method seldom fails in deciduous trees if properly used. It is essential to have the chemical in contact with sapwood and not in the heartwood only. When branches 3 or 4 inches in diameter are available for the test, one 7/16" hole, deep enough to accommodate the chemical, is sufficient. The hole should be a foot or more above the base of the branch to prevent the chemical from reaching an adjoining branch. In larger branches or trunks the holes are spaced about 3½" apart on the circumference to insure distribution of the chemical. About 1½ grams of borax or the sulfates of copper, manganese and zinc are placed in the holes. A piece of ⅜" thin wall brass tubing fitted with a plunger with a 1" stroke makes a convenient tool for placing these salts in the hole. The holes should be sealed with grafting wax or other suitable materials.

Many of the county agents in California are equipped with kits for making these limb injection tests. In a number of cases this method has lead directly to commercial applications of micro-nutrients which have been of great benefit. In one county two years after four small olive limbs had shown striking response to boron injections, almost the entire affected area of about 2000 acres had been commercially treated.

One might expect that multiple deficiencies would complicate the problem of diagnosis. Combinations of zinc and iron and manganese and iron deficiency in the same tree which could be distinguished without much difficulty have been seen. Furthermore, these deficiencies are never uniform throughout the orchard so some trees can usually be found that show the deficiency of only one element.

There has been some speculation on the increase of micro-nutrient troubles as a result of cultural operations and the use of chemical fertilizers. The only clear case seen here of the development of a deficiency in a district concerns zinc. In one peach district zinc deficiency has been unknown on mature peach trees except in an occasional corral spot. In recent years this deficiency has commonly been found in young trees planted where old orchards have been removed. Apparently the old trees had depleted the limited supply of zinc so that the young trees are unable to secure enough for normal development.

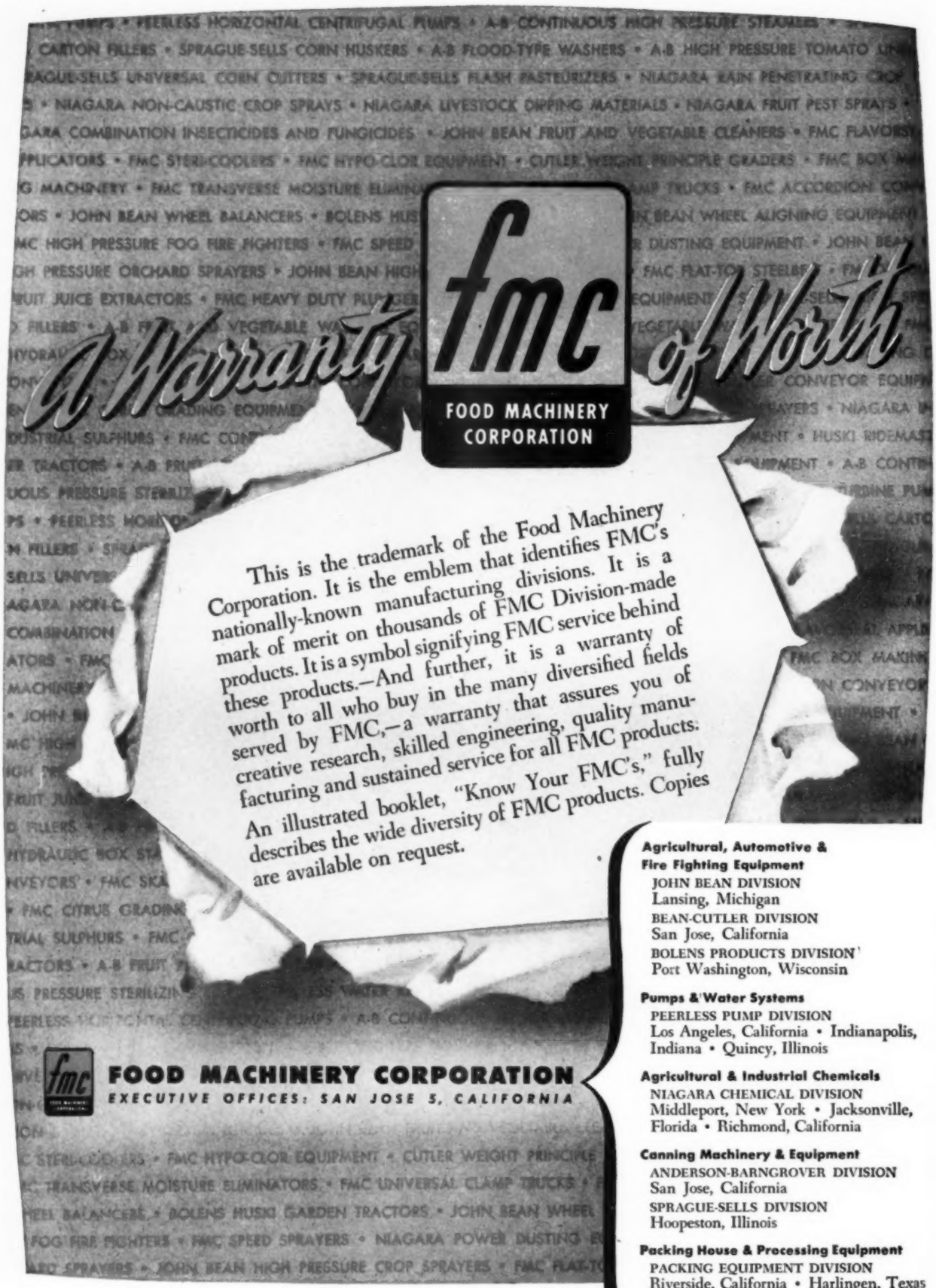
Supplying Fruit Trees

THE method used to correct micro-nutrient deficiencies varies with the element, the kind of tree and the soil type. Injections of dry salts are quite dependable in all of the deciduous fruits and nuts with which experiments have been made. This method is valuable for diagnosis and is used commercially by pear growers to correct iron deficiency or lime-induced chlorosis. The effectiveness of soil applications varies greatly with the element and soil type. Boron is the only element for which soil treatments have been generally successful. Zinc and manganese deficiency occur on a wide range of soil types with variable results when reasonable amounts are applied on the soil. As these elements can be applied as sprays on most kinds of trees so economically, frequently in combination with fungicides or insecticides, there has been less incentive to develop soil treatment methods.

Cherry and walnut do not respond to zinc sprays and on some soils do not benefit adequately from economical soil treatments. In such cases pieces of zinc coated iron driven into trunk and limbs afford correction and are used commercially. This is a laborious treatment and is seldom used where other methods are effective.

Permanent cover crops have long been known to be beneficial to orchard trees affected by lime-induced chlorosis and in cases of zinc deficiency. Unfortunately, this means of alleviating these difficulties has seldom been usable in California. Where these deficiencies are severe, the benefit from cover crops is not sufficient and there are a number of objections to its use for nearly all of the conditions of experimentation.

A summary of our experience with diagnostic tests and corrective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Zinc deficiency most common in California fruit trees, except that of nitrogen. Deficiency equalized by a foliage spray and dormant application of zinc sulfate. Other methods needed for cherry and walnut trees which do not respond to sprays. Soil application undependable because of high fixing properties of much of the soil.

treatments for the several elements follows:

Boron

BORAX is used commercially on a considerable acreage of olives and pears in five counties. In both species the deficiency is readily corrected by dry salt injections, foliage sprays and soil applications. Severe symptoms can be corrected in large olive trees with ½ lb. of borax in the soil. The olive tolerates much larger amounts, so the growers have generally treated in excess of the actual requirement of the tree. For this reason we have been unable to learn much about the duration of soil treatments. The pear responds satisfactorily if borax is put on the soil in the early fall, but spring applications may fail to prevent symptoms in the current season. One phase of boron deficiency in pear is blossom killing, followed by dieback of shoots and branches, which may appear unexpectedly within the deficiency districts. When such blossom killing is noted, a prompt spraying of the immature foliage is very effective in preventing further dieback. Except for such special cases soil applications are generally recommended.

Copper

COMMERCIAL experience with this deficiency has been very limited in the few small fruit districts where it has been observed. Bordeaux mixture has afforded correction when applied to immature leaves of apple, pear, prune and walnut. Five pounds of copper sulfate produced normal growth in young prune trees in one orchard but 50 lbs. per tree failed to correct affected pear trees in other areas.

Iron

IRON deficiency or lime-induced chlorosis is included in this discussion because it behaves like the micro-nutrient elements. The only corrective method used commercially for trees is the dry salt injection, usually of ferric citrate. Many pear growers have kept trees in production for the past 20 years or more that would not have been profitable otherwise. Power drills and compressed tablets or pellets now facilitate this operation.

Soil treatments with iron sulfate can be used on some shallow rooted plants and small shrubs, but reasonable amounts are ineffective for orchard trees. Sprays of iron sulfate and other iron compounds, so far as tested, will produce only a few scattered green spots in the chlorotic leaf of pear or peach. This greening may be greatly enhanced by using the iron salt in a very acid solution, but apparently not without producing a mixture which causes fruit russetting.

Manganese

MILD symptoms of this deficiency can be found quite commonly on several of our deciduous orchard trees on many soil types. Where the trouble is severe enough to require attention it is corrected by foliage sprays of manganese sulfate. Ten pounds of manganese sulfate per tree in the soil has been effective on peach in experiments in several areas.

Zinc

ZINC deficiency affects a far greater acreage of fruit trees and grapevines in California than does that of any other element except nitrogen. All the stone fruits but cherry are corrected satisfactorily by dormant applications of zinc sulfate as a spray. In a few instances, particulary with young trees growing very rapidly, a foliage spray is used alone or to supplement the dormant spray. Spur-pruned grapevines are treated by daubing the freshly cut pruning wounds with a strong solution of zinc sulfate (1½ lbs. per gallon). Other methods must be used for cherry and walnut as they are seldom helped by either dormant or foliage sprays. The only certain method of applying zinc to these trees is to drive pieces of galvanized iron into the trunk and main limbs. This method is quite tedious but the effect seems to last indefinitely if enough zinc pieces are used to meet the requirements of the increase in growth of the tree.

Soil applications are effective in a few areas but are not dependable because of the high fixing power of the soil in many areas where zinc deficiency is severe.★★

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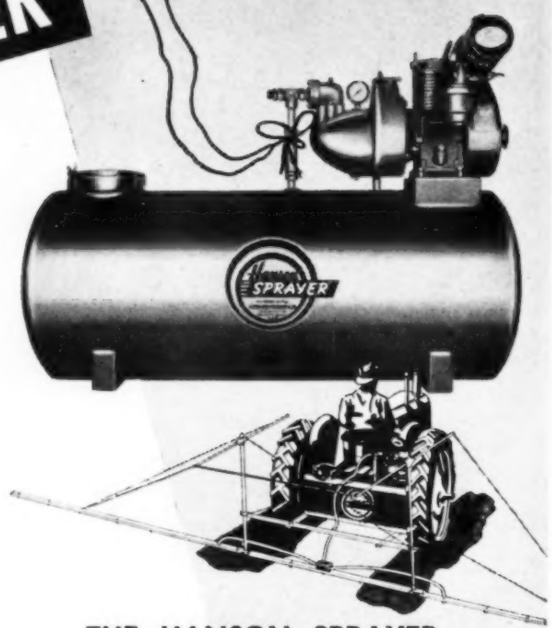

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Sub-Committee in Washington Hears Discussion on Drift of

2,4-D Dust

TESTIMONY regarding 2,4-D was heard by members of the House Agricultural sub-committee at a hearing in Washington on April 21. Witnesses included Rep. Clark W. Thompson, Texas, author of HR 452, a resolution for the regulation of 2, 4-D; Drs. W. G. Reed, E. L. Griffin, L. W. Kephart, and Cullinan of the U. S. Department of Agriculture; Lea S. Hitchner, executive secretary of the A.I.F. Association; representatives of the Civil Aeronautics Authority; and Dr. C. E. Minarik, U. S. Army Chemical Corps.

Mr. Thompson, in setting the stage for testimony to follow, told the sub-committee that 2,4-D is a valuable asset to agriculture, and expressed a hope that local legislation will not deprive farmers of its benefits. Some kind of regulation is necessary, however, because careless use of the material may be dangerous to crops.

Dr. F. P. Cullinan, assistant chief of the Bureau of Plant Industry, Soils and Agricultural Engineering, U.S.D.A., followed to state that weeds present the most serious problem in food growing. He said that 2,4-D had been regarded as a dangerous weapon from the start, but that more information is being found so that its limitations may be recognized. Drift is one of the most important hazards, he said. The dust has been known to carry from five to ten miles in a 10 mph wind, he stated, and a very little 2,4-D can do much damage under certain conditions. He emphasized, however, that it would be a "great mistake" to restrict too greatly the use of 2,4-D in agriculture.

Dr. L. W. Kephart, U.S.D.A. agronomist, and a pioneer in use of 2,4-D, told the committee that the first commercial use of the material was in 1944, and that although cautions had been issued against drift, the 1946 cotton disaster was surprising in its scope and severity. He told of investigations being carried on since that time to determine the conditions under which drift is most hazardous. Conditions such as atmosphere, temperature, height of plane, etc. are all being taken into consideration. In one instance where a quantity of 2,4-D was accidentally discharged from a plane several thousand feet high, the dust is said to have drifted 35 to 40 miles. Planes dispersing 2,4-D should fly "very low"; about 20 feet above the ground to avoid excessive drift. Experiments are under way to check drift under known conditions, through the use of 2,4 D "traps" set at various spots and distances from the treated field. Use of 2,4-D dust is not being recommended, he said. It will not be used during the coming season. Spray materials, being heavier, settle faster.

Both the U.S.D.A. and the Texas Agricultural Experiment Station as well as other groups interested in working out the problem, should work together, Dr. Kephart suggested. The problem has too many angles for easy solution.

Asks USDA Cooperation

MR. Hitchner recommended that the U. S. Dept. of Agriculture spearhead an educational program in a coordinated effort with industry, to bring about better understanding on the part of all users. In this connection he suggested as one possible solution, state registration of all airplane operators who apply 2,4-D. He described briefly the educational program under way by the A.I.F. Association, in which proper handling of not only 2,4-D is taught, but also the hazards involved in other agricultural chemicals.

From the manufacturers' standpoint, he said, 2,4-D is made according to specifications, is properly labeled with full warnings and instructions, and the responsibility for its application should rest on the persons making the application.

Dr. E. L. Griffin, Production and Marketing Administration, U.S.D.A. took the stand to relate the history of labeling for 2,4-D materials, stated that current labels were drawn up in conformity with the regulations of the Federal Insecticide, Fungicide, and Rodenticide Act of 1947. The best information available was used in 2,4-D labels. It includes warning statements and use instructions, with some information on the nature of the material and its action on plants. Dr. Griffin said that such labels are adequate, *if followed*. Seeing that the latter point is done, is the crux of the entire matter, he said.

Dr. C. E. Minarik of the U. S. Army Chemical Corps told the committee that his group had not been too interested in 2,4-D as a dust, because of the drift hazard. He said that it might be more effective used as a spray in order to avoid trouble. The U. S. Department of Agriculture is the most logical agency to carry out the provisions of the resolution, he stated, and added that the work should be done this year. He also emphasized the need for more appropriations for this purpose.

C.A.A. On Stand

REPRESENTATIVES of the C.A.A. called to the stand included George D. Childress and John C. Chamberlain as well as a C.A.A. attorney, Mr. Calkins. Under questioning by Rep. Thompson, Mr. Childress stated that the C.A.A. has power to regulate the use of planes in dusting and spraying operations, but it had not attempted to do this beyond checking on safety factors and inspecting the craft for its airworthiness. He stated that some duster operators fly in violation of present

(*Turn to Page* 79)

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American Plant Food Council CONVENTION

Dates set for June 13-16 at Greenbrier, White Sulphur Springs, W. Virginia Third annual meeting for Council

HIGH-LIGHTED by an address by Dr. Francis P. Gaines, president of Washington and Lee University, the third annual convention of the American Plant Food Council will be held at the Greenbrier, White Sulphur Springs, W. Va., June 13-16. In addition to Dr. Gaines, other speakers will include well-known agricultural editors, soil scientists, and members of Congress and the U. S. Senate.

The Monday morning session will be featured by addresses by United States Senator Scott W. Lucas, Illinois, member of the Senate Agriculture Committee; and Dr. Robert E. Yoder, of the Agronomy Department, Agricultural Experiment Station, Wooster, Ohio. In the evening a showing of the film "First in the Hearts of Farmers" will be held. This picture, on 16mm. sound film, has been shown to numerous audiences in may parts of the U. S. since its release by the A.P.F.C. last year.

Below: first photo, L to R: Three members of the APFC Convention Committee: W. T. Wright, chairman, vice-president of F. S. Royster Guano Co., Norfolk, Va.; George E. Petitt, vice-president, Potash Company of America, New York City; and J. A. Howell, executive vice-president, Virginia-Carolina Chemical Corp., Richmond, Va. Center photo is Dr. Francis P. Gaines, president of Washington & Lee University, Lexington, Ky.; and at the right is Clifton A. Woodrum, president of the American Plant Food Council, Washington, D. C.

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Program to include many phases of plant nutrition and discussions of future of fertilizer business. Dr. Gaines to discuss the "First and Final Frontier"; Dr. Parker to talk on "Radioactive Materials in Fertilizer Research." Editors' forum featured.

To continue an annual feature of Council Conventions, the program of Tuesday, June 15, will begin with an Agricultural Editors' forum on "The farmer and private enterprise." Leader of this symposium will be Dr. Paul D. Sanders, president of the American Agricultural Editors' Association, and editor of *The Southern Planter,* Richmond, Va. Other participants on the forum will include Carroll P. Streeter, managing editor of the *Farm Journal,* Philadelphia; Dr. L. R. Neel, editor of the *Southern Agriculturalist,* Nashville, Tenn.; and Paul C. Johnson, editor of the *Prairie Farmer,* Chicago. The evening program will be featured by the Council's annual banquet, speaker at which will be Dr. Gaines. His subject has been announced as being "The First and Final Frontier."

Addresses by Dr. Frank W. Parker, assistant chief, Bureau of Plant Industry, Soils and Agricultural Engineering, U.S.D.A., Beltsville, Md.; and Representative August H. Andresen, Minnesota, a member of the House Agriculture Committee, are scheduled for the meeting. Dr. Parker is to discuss the use of radio-active materials in fertilizer research, pointing out that private industry was the first to appropriate funds for such research in the agricultural field.

The convention will be concluded on June 16 with a meeting of the new board of directors, members of which are to be named at a business meeting the previous day . The Council is to name eight new directors at this session. Clifton A. Woodrum, president of the Council, will preside at the board meeting.

Recreational activities are to include golf, with a tournament to be played and trophies awarded in various classes. A committee in charge of golf arrangements is functioning under the chairmanship of A. B. Baker, Jr., New York. Other members of the committee include: A. B. Baker, Sr., New York; C. F. Burroughs, Jr., Norfolk, Va.; J. D. Stewart, Jr., Louisville, Ky.; and J. A. Woods, Jr., Tampa, Florida.

Carroll P. Streeter

To appear on the editors' forum. He is managing editor of the Farm Journal, a graduate of Iowa State College, and has had wide experience in journalism.

August H. Andresen

Representative from Minnesota. He has distinguished himself in his legislative career in working for the welfare of agriculture.

Dr. Paul D. Sanders

To be in charge of editors' forum at APFC convention. He is editor of Southern Planter, and holds national honorary offices.

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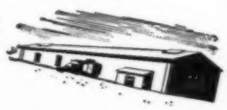

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National FERTILIZER Association

June 21, 22, 23
White Sulphur Springs W. Va.

NFA Convention

SPEAKERS representing the agricultural press, State Agricultural Experiment stations, farm groups, and the fertilizer manufacturing industry are scheduled to appear on the program of the National Fertilizer Association's 23rd annual convention during three days in June. The dates are Monday, June 21 through Wednesday, June 23; and the place is the Greenbrier Hotel, White Sulphur Springs, West Virginia.

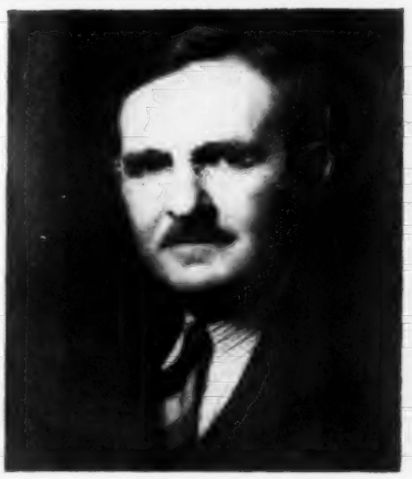
Convention plans, which are nearing completion as this issue went to press, provided for a meeting of the NFA Board of Directors on Monday, June 21, and the annual open meeting of the Plant Food Research Committee, with Dr. H. B. Siems, chairman of the committee, presiding. Reports will be presented by various subcommittee chairmen.

A motion picture which deals with the role of copper in plant food and animal nutrition is scheduled to be shown Monday evening. This film will be in charge of Dr. George K. Davis, nutrition technologist of the Department of Animal Husbandry, Agricultural Experiment Station, College of Agriculture, Florida University, Gainesville.

The program of Tuesday will be devoted to business sessions, with the annual NFA dinner in the evening. Speakers scheduled for various times during the programs of both Tuesday and Wednesday include Maurice H. Lockwood, president of

(*Turn to Page* 79)

Below are three principals of the NFA convention. Left to right, they are: Maurice H. Lockwood, NFA president; Wheeler McMillen, editor-in-chief, the Farm Journal and Pathfinder; and Weller Noble, chairman of NFA directors.



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The Listening Post

This department, which reviews current plant disease and insect control problems, is a regular monthly feature of AGRICULTURAL CHEMICALS. The comments on current plant disease problems are based on observations submitted by collaborators of the Plant Disease Survey, Bureau of Plant Industry, Soils, and Agricultural Engineering, U. S. Department of Agriculture, Beltsville, Md.

By Paul R. Miller

Progress Report on Various Plant Diseases

LATE blight was causing severe losses in unsprayed tomato seed beds in the Everglades section of Florida at the beginning of March, although well-sprayed beds showed none. Adequate spraying programs controlled it in tomato fields, and spring potatoes in the region were being sprayed regularly and showed no late blight or only a trace. In lower East Coast section, hot dry weather prior to March 4 checked development of the disease on tomatoes in the vicinity of West Palm Beach, while around Stuart somewhat farther north all commercial tomato fields, except one that was sprayed on a five-day schedule with "Dithane"-zinc-lime, were killed by late blight during the latter part of February. Favorable rains and temperatures induced revival of activity in West Coast tomato seed beds March 8. In the North-central section late blight, which had been suppressed since the January freezes, again became active on potatoes by the latter part of February, and a single infection was found in tomato seed beds March 8. In upper East Coast sections, the disease remained active in tomato seed beds in the Sanford region, although it was controlled with copper or "Dithane" sprays. Late blight was present in several fields near Brunnel, in the southern part of the important Hastings potato area, at the end of February, and was found March 4 in a field near Hastings. Rain, cloudy weather, and cool night temperatures were very favorable to the disease. Most growers were using copper dusts, but it was estimated that about 20 percent of the 11,000 acres of potatoes in the section would be sprayed with "Dithane."

Late blight had not appeared in Texas during the past two seasons, but on March 4 of this year it was found in several scattered fields in the Lower Rio Grande Valley. One 200-acre Bliss Triumph field was rather generally affected and had probably been infected several days earlier. On March 3 the center of the main potato area of about 20,000 acres appeared to be free from late blight, as did tomatoes in the same section. December tomato plantings had been killed by freezes in February and the plants were still very small. Both airplanes and ground machines are being used for dust applications. Wind beginning about 9 o'clock in the morning usually stops airplane application during the remainder of the day.

Tobacco Blue Mold

DURING the first days of March blue mold appeared in a large number of beds scattered throughout the flue-cured area of Georgia. Widespread disease devolopment, with 100 percent infection in entire beds, has already occurred in some locations where beds are furthest advanced. Growers are spraying or dusting with "Fermate."

The first blue mold in Gadsden County, Florida, this year was found by a grower on February 23, a few days earlier than usual, on shade tobacco seedlings. A ten-foot circle and a few smaller spots were affected in a second-year bed, and a two-foot circle in a nearby new bed. Dusting with 20% "Fermate" in talc was started at once, and some other growers have started dusting. Condition of beds in both States is generally good, although germination in Georgia was delayed by cool wet weather.

Cucurbit Downy Mildew

IN Florida, downy mildew was very active on squash and cucumber plantings in the West Palm Beach and Stuart areas at the beginning of March, and was reported on cucumbers at Sanford during the last week in February and near Ruskin on March 2.

Injury from Chemicals

PETER A. Ark and C. Emlen Scott of the University of California report that in the spring of 1947 a mixture of organic polysulfides known as "Thiocol WD-2" was used to increase the deposition of the basic materials in various copper and other sprays tested for the control of bacterial blight of walnut. No significant improvement of the sprays resulted, while a considerable decrease was noticed in the size of the nuts harvested from plots on which it was used. In plots on which the polysulfide mixture was added to the sprays the yield ranged from 72 to 87 percent of large and 10 to 28 percent of medium size nuts; as compared with 88 to 94 percent of large and 6 to 12 percent of medium nuts from plots sprayed with the same materials without the addition of the polysulfide.

M. C. Goldsworthy and John C. Dunegan of the U. S. Bureau of Plant Industry, Soil, and Agricultural Engineering report that addition of technical DDT to field soil at various concentrations resulted in significant reduction in the subsequent growth of Blakemore strawberry plants, the reduction increasing with increased concentration of DDT. Both number and size of new runner plants were less on treated than on non-treated plots. Leaves from the non- treated plots were more succulent and the plants had much larger and more fibrous root system. Apparently the

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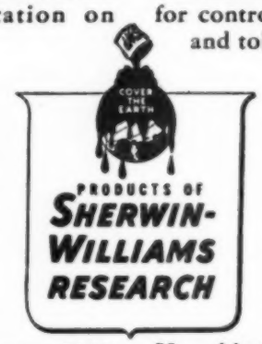
ARSENATE OF LEAD

This Sherwin-Williams concentrate is readily blended, in the ratio of 1 part of ARSENATE OF LEAD to 3 to 4 parts of hydrated lime and other agricultural chemicals, to make finished insecticide dusts intended for application on vegetable crops.

CHLORPHEEN* 40% DUST

Containing 40% by weight of technical Chlorinated Camphene, CHLORPHEEN 40% DUST can be blended with any diluent (except those of a highly alkaline nature) to make a free-flowing dust for control of grasshoppers and cotton and tobacco insects.



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All-purpose neutral copper fungicide containing at least 52% metallic copper. For blending into 7% or 9% copper dusts.

DDTOL* 50% DUST
Readily blended with diluents to make free-flowing 3% or 5% DDT dusts. (DDTOL VINE-SAFE 50% WETTABLE also available, containing 50% specially refined DDT.)

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For blending to make 10% to 20% dusts.

ZINC SULFATE 36%
Spray-dried material for use in products for correcting nutritional deficiencies; "safener" for Arsenate of Lead.

B-C-A ®
(Basic Copper Arsenate.) Total arsenic (expressed as metallic) not less than 24.2%. Copper (expressed as metallic) not less than 41%.

ISO-HEX* 6%-12%-18% DUSTS
Concentrates contain the gamma isomer of Benzene Hexachloride. For blending with diluents to make dusts for control of cotton and truck crop insects.

PARIS GREEN
For the manufacture of poison baits for cutworms and of dusts for shade tobacco.

HALODANE* 40% WETTABLE
For blending with any diluent (except highly alkaline ones) to make 3% or 5% Chlordane dusts.

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AGRICULTURAL CHEMICALS

chemical induces a physiological change in the root system, which is characterized by a thickening of the main and secondary roots and a loss of the ability to form fibrous roots. As a result of this reduction in root system, the treated plants grew less vigorously, matured earlier, and produced fewer runners. In no case was the toxic action of DDT sufficient to kill the mother plants. The effect persisted for at least two crop years. This may have a serious implication, according to these investigators, since it indicates that successive annual accretions of DDT over a period of years, either directly or through spraying practices, once it is added to the soil, may be sufficient to cause injury to subsequent plantings of the sensitive Blakemore strawberry plants. How many other economic crop plants may be injured is not known, but it appears certain that some caution is necessary in the promiscuous use of the material, either as insecticidal sprays or as soil additions to combat insects in the soil.

Insect Conditions in Late March and Early April

This column, reviewing current insect control programs, is a regular feature of AGRICULTURAL CHEMICALS. Mr. Haeussler is in charge of Insect Pest Survey and Information, Agric. Research Adm., B. E. & P. Q., U.S.D.A. His observations are based on latest reports from collaborators in the department's country-wide pest surveys.

By G. J. Haeussler

OBSERVATIONS made by the Bureau of Entomology and Plant Quarantine and cooperating agencies during March indicate that boll weevils survived the winter in smaller numbers than last year in Louisiana and Mississippi. In Texas and South Carolina, however, the weevils appear to have come through the winter in larger numbers than last year. Thrips and cutworms were already causing some damage to the cotton crop during March in the Lower Rio Grande Valley of Texas and control measures were being applied. Bollworms were also noted in that area in March.

A large overwintering population of European red mite eggs occured on apple in the vicinity of Kearneysville, West Virginia and overwintering eggs of this pest were reported as more abundant than usual in the vicinity of Vincennes, Indiana. Hatch began early in April at both points. Population of the two-spotted spider mite appear lighter than normal in orchards at Vincennes.

The red-banded leaf roller shows an increase over last year in apple orchards near Kearneysville, W. Va. At Vincennes, Ind. the leaf roller population is slightly less than it was a year ago and moth emergence began not later than March 24.

A light population of over wintered codling moth larvae is reported from Kearneysville. The winter carryover at Vincennes is expected to be about double that of a year ago, but less than in years before DDT came into use. Pupation began early in April at Vincennes.

Adults of the Mexican bean beetle were observed beginning to attack beans shortly after the middle of March in southern Georgia and in Gadsen County, Florida. Adults began to appear on snap bean plantings in the Charleston district of South Carolina in early April.

Some injury to beans from cucumber beetles was reported from parts of Georgia and Florida during the last half of March and from these States and South Carolina during the first half of April. The spotted cucumber beetle caused severe injury to bean seedlings in many home gardens in the Stafford district of Texas around April 1.

The serpentine leaf miner caused some injury to beans in Manatee County, Florida during March and the damage increased somewhat during the first half of April.

Cabbage caterpillar populations were generally light to moderate throughout the South from the middle of March to the middle of April and were reported as of little consequence on cole crops in Southern California.

In early April, cutworms were numerous in the heads of cabbage in some fields of the Gulf Coast district of Texas and caused occasional injury to cabbage in parts of Florida. These insects caused serious injury to celery and corn in the Everglades district of Florida about the middle of March and were still damaging various vegetables in that area by the middle of April. A severe infestation of cutworms occurred on mature celery in the Zellwood district of Florida.

The Colorado potato beetle began to appear on Irish potato and newly set tomato plants in the northwestern part of Florida toward the end of March. This insect was on the increase in some sections of Georgia and Florida during the first half of April. The first beetle was observed in South Carolina on March 26.

Populations of the onion thrips were increasing in parts of southern California toward the middle of April. This pest caused serious damage in some onion fields of southern Texas during the last half of March.

Toward the middle of April aphid infestations were reported as general on various vegetables, including pepper, tomato, cucumber and celery in Florida; on various vegetables in Mississippi; on potatoes in South Carolina; and on spinach in California. Light to moderate infestations of aphids were also reported at that time on newly set tobacco and in some tobacco plant beds in Florida, Georgia, and South Carolina. The pea aphid was present on peas in the Charleston section of South Carolina toward the end of March and moderate infestations were reported on garden peas there toward mid-April. About the middle of March a serious pea aphid infestation was reported on 70,000 acres of alfalfa in the Antelope Valley of California. The insect continued abundant in alfalfa fields of southern California.

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It's no longer just a wonderful *idea* — it's a proved *fact!* Mist spraying does a better job, a cleaner job, in less time and at HALF THE COST. Write for copies of letters from those who have used Lawrence Aero-Mist Sprayers. Read what these users say about them after a full year's experience. Lawrence equipment pioneered in this field, developed the turn-table design and the unique centrifugal blower. It has now been thoroughly tested and proved by enthusiastic users all over the country.

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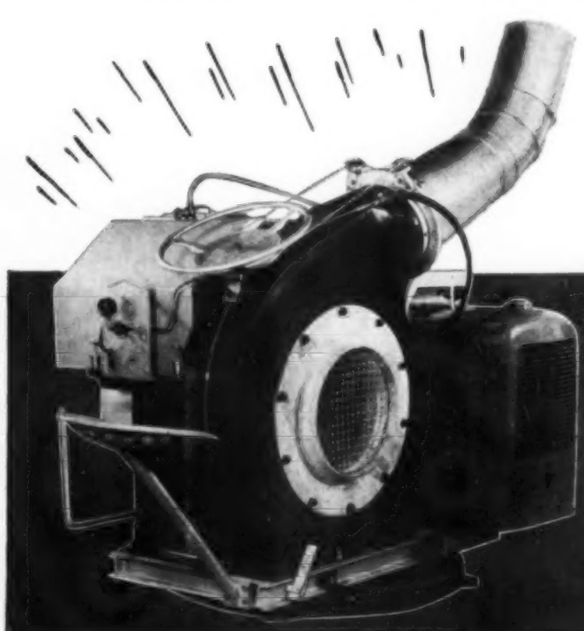

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Suppliers' Bulletins

Westvaco DDT Booklet

Westvaco Chemical Corporation's Agricultural Chemicals Division, New York, has issued a new 12 page brochure on DDT and its application. Included in the booklet is a table giving the dosage recommended in the control of 98 different insects and parasites on 34 fruits and vegetables. A tabular digest is also included, giving instructions and dosages of DDT mixtures in controlling common pests in farm buildings and on livestock. Copies are available from the company, 405 Lexington Ave., New York 17.

•

Dust Collector Bulletin

Pulverizing Machinery Co., Summit, N. J. has issued a new illustrated bulletin, "Optimum Recovery with Mikro-Collector." Complete description of the dust-collecting device is given, including information on its ability to handle damp dust loads. The bulletin is available from the company, 256 Chatham Rd., Summit, N. J.

•

Catalog of Fittings

Flodar Corp., Cleveland, Ohio has issued a new catalog on its line of tube fittings designed to contain liquids under high pressure. Completely detailed engineering specifications are presented for both the no flare fitting, and the flare type fitting. Copies of the catalog are available from the company, 331 Frankfort Ave., Cleveland, Ohio.

•

New U.S.D.A. Publications

The U. S. Department of Agriculture has announced that a number of new publications are now available. Copies of these may be obtained by writing to the Bureau of Entomology and Plant Quarantine, Washington 25. The Department points out that these are issued in limited editions. They include:

E-741—Bureau of Entomology and Plant Quarantine Articles Published in 1946. Division of Insect Pest Survey and Information.

E-742—A Review of DDT Formulations. R. D. Chisholm.

E-743—Investigations of Sprays for Control of the European Corn Borer, Toledo, Ohio, 1945-1946. D. D. Questel and R. V. Connin.

E-744—Preliminary Tests of Synthetic Organic Compounds as Insecticides. Part V. G. T. Bottger and A. P. Yerington.

ET-251—An Improved Aerosol Nozzle for Use on Engine Exhausts.

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Offers New Test Cages

H. T. McGill Co., Houston, Texas, announces the development of insect test cages for use in checking the fumigation of stored bags of grain. The new device enables the operator to check insect mortality inside a tightly-packed area by use of a saran tube which may be inserted deeply into the stack of bags or boxes and removed without having to disturb the stack. Information is available from the company, 3814 Burch, Houston 3, Tex.

•

Hudson Issues Folder

H. D. Hudson Mfg. Co., Chicago has recently issued a six page folder describing and illustrating the company's "Peerless Power spray line." Included are trailer sprayers, hand-portable types, and skid-mounted models. Full details are given for each machine in the brochure. Write for it to H. D. Hudson Mfg. Co., 589 E. Illinois St., Chicago 11.

Shown above is Hudson's new "Peerless Trail-A-Spray," with 150 gallon tank. Choice of 2 or 4 GPM output.

•

"Tossit" Literature

Southern Entomological Company, W. Palm Beach, Florida, has recently printed pamphlets on its DDT product, "Tossits" for control of land crabs. The product, sold only through dealers or distributors, is in capsule form, to be placed in ground holes to control the land crab pests. Information may be had from the company, P.O box 3191, W. Palm Beach.

•

Weed Control Booklet

The agronomy department of the South Dakota Agricultural Experiment Station, Brookings, S. D. has recently issued circular 69, "Chemical Control of Weeds in South Dakota." The booklet describes 2,4-D in detail, including its use as a herbicide, formulations, rates of application, reaction of weeds to the compound, use of 2,4-D in crops; as a pre-emergence treatment; equipment for application; and how to calculate the amount of 2,4-D to be used.

The folder also discusses the herbicidal action of borax, sodium chlorate, the dinitros, IPC (isopropyl-N-phenyl carbamate) and ATA (ammonium trichloracetate.

•

Ammonia Booklet Issued

The Agricultural Chemicals division of Commercial Solvents Corporation, 17 E. 42nd St., New York, has recently issued a 48 page booklet on "Ammonia—Its Uses and Properties." The book describes proper handling of ammonia in shipment, unloading and in storage, and has charts and tables to present data on the physical and chemical properties of both anhydrous and aqueous ammonia.

•

Orbis Catalog Ready

Orbis Products Corp., 215 Pearl St., New York, has just issued a 28 page catalog and price list, covering the complete line of Orbis insecticides, essential oils, drugs, gums, and perfume bases.

There's Money in Weeds...

When You Handle DED-WEED* 2,4-D WEED KILLER

FARMERS DEMAND DED-WEED...

BECAUSE DED-WEED IS AN EFFICIENT, ECONOMICAL, SELECTIVE WEED KILLER

Extensive tests and actual use have proved conclusively that DED-WEED, properly used, will eliminate many noxious weeds and encourage bigger crop yield.

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- **Ded-Weed "40"**—An amine salt concentrate, completely water soluble, containing 4.16 pounds 2,4-D acid equivalent per gallon.
- **Ded-Weed "ME-4"**—A methyl ester concentrate, readily water-emulsifiable and oil soluble, containing 2.7 pounds 2,4-D acid equivalent per gallon.
- **Ded-Weed "ME-5"**—A methyl ester concentrate, readily water-emulsifiable and oil soluble, containing 3.58 pounds 2,4-D acid equivalent per gallon.
- **Ded-Weed "70" Powder**—A completely water soluble powder, containing 70% 2,4-D acid equivalent.

BECAUSE DED-WEED'S BIG ADVERTISING CAMPAIGN HAS "PRE-SOLD" THEM

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There is a tremendous demand for Thompson-Hayward insecticides. Those listed below are available as water emulsifiable and oil soluble liquid concentrates; wettable powders, dust base concentrates and low strength dusts.

Ded-Tox (DDT) **Tri-6* (BHC)** **Phenacide (Toxaphene)** **Toxiclor (Chlordane)**

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Technical Briefs

Control of Plant Diseases

Ferric dimethyl dithiocarbamate is a satisfactory material for the control of apple blotch caused by the fungus *Phyllosticta solitaria*, according to John C. Dunegan, M. C. Goldsworthy, and R. A. Wilson of the U. S. Bureau of Plant Industry, Soils, and Agricultural Engineering. They report that of several materials compared in tests in Delaware, three—bordeaux mixture, copper 8-quinolinolate, and ferric dimethyl dithiocarbamate—gave excellent control, but only the last-named controlled the fungus without producing either russetting of the fruit or scorching of the leaves. This compound has the disadvantage of leaving a conspicuous dark residue on light colored fruit, but the residue is easily removed by brushing and seems to cause no permanent injury to the surface of the fruit.

Dunegan and Goldsworthy also report experimental results indicating that control of peach blossom blight reduces the amount of fruit brown rot at harvest time. Both diseases are caused by the fungus *Monilinia fructicola*. In tests in Delaware, trees were sprayed during the blooming period with various chemicals, of which one, 2,3 dichloro-1,4 naphthoquinone, gave outstanding control of blossom blight. Trees sprayed with this material had less rotted fruit at harvest time than did any of the trees sprayed with the other compounds.

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Grasshopper Control Tests

Control tests of grasshopper in alfalfa with chlordane, benzene hexachloride, a methoxy analog of DDT, a chlorinated camphene, dusts containing piperonyl cyclohexenone and pyrethrum, sabadilla, and hexaethyl tetraphosphate, showed chlordane to be the most promising material. At least a 90 per cent kill was obtained with an emulsion spray containing chlordane, which also had a marked residual effect. Emulsion sprays were more effective than dusts at the same rate of application. Insects essential to the setting of seed were not harmed when the fields were sprayed in the prebloom stage. Chlordane was 2-4 times more toxic to sheep than was DDT. E. J. Hinman and F. T. Cowan, Bur. Entomol. and Plant Quarantine *E-722*, 21 pp. (1947).

•

Fungicides in Wheat

Of more than 100 compounds tested for fungistatic ability on stored wheat, eight compounds extensively tested as moldicides on wheat with a moisture content of 20 percent, were rated in order of decreasing value as follows: 8-hydroxquinoline sulfate, thiourea, p-aminobenzoic acid, sulfonamide, 2-aminothiazole, chloramine B, and calcium propionate.

Few of the 100 compounds effectively inhibited the growth of molds on or in the seed. Some compounds inhibited certain molds but not others, or inhibited the surface growth and spore production of certain molds without preventing the growth of the molds in the interior of the seed. This suggests that the effectiveness of a given compound in inhibiting the development of molds on or in moist stored seed of any kind can be ascertained only by determining the number and kinds of molds originally present, and their subsequent increase or decrease after the seed has been treated with the supposed fungicide. —Max Milner, C. M. Christensen and W. F. Geddes in *Cereal Chemistry*, 24, 6, Nov. 1947.

•

Seed Treatment Noted

Drs. W. T. Schroeder and R. E. Foster of the Geneva, N. Y., agricultural experiment station stated recently that two fungicidal materials, "Arasan" and "Phygon" are outstanding as seed treatments for nearly all of the vegetable canning crops. The fungicides, when used alone, protect the seeds from any damping-off fungi which may be present in the soil, according to the report. Although the dust from "Arasan" may sometimes be irritating to people working near it for any length of time, both it and "Phygon" can be mixed with water. The resulting slurry is shaken with the seed to complete the treatment. Dusts, however, were reported to be satisfactory when used on garden packets, or in small quantities.

•

Control of Cattle Lice

By dipping cattle in a 0.3 percent suspension of benzene hexachloride, cattle lice were eradicated, reports D. P. Furman in the *Journal of Economic Entomology* (40, 672-5) The insecticide was prepared from a commercial 50 percent wettable powder and was equivalent approximately to 0.036 percent of the gamma isomer.

•

Combine 2,4-D & Chlordane

Julius Hyman & Co., Denver, in cooperation with county agents in Colorado, are experimenting with control of "one shot" control of both weeds and insects by combining chlordane with 2,4-D in dusts and sprays. It is pointed out that the weeds often shelter insects, and that when the weeds are destroyed, the insects immediately migrate to adjacent fields, consuming crops while en route.

George L. James, agricultural agent of Weld County reports using 2,4-D and chlordane together as a roadside spray. The mixture has been at the rate of 1,000 ppm of 2,4-D; and chlordane at the rate of one pound of active material per acre of spray. Mr. James reports the combination is "working satisfactorily."

•

2,4-D vs Weeds in Rice

Airplane applications of several preparations of 2,4-D including both dusts and sprays were made in 20 to 25-acre plots in a large field of rice June 24 and 25. Both water and oil solutions were used. A rain about 6 hours after the dust applications washed off most of the dust, except for an isopropyl-ester dust with oil, and consequently caused no serious

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Hudson pneumatic tire Power Sprayer with trailer hitch. Discharge capacity 2 or 4 gallons per minute. 150 Gallon tank.

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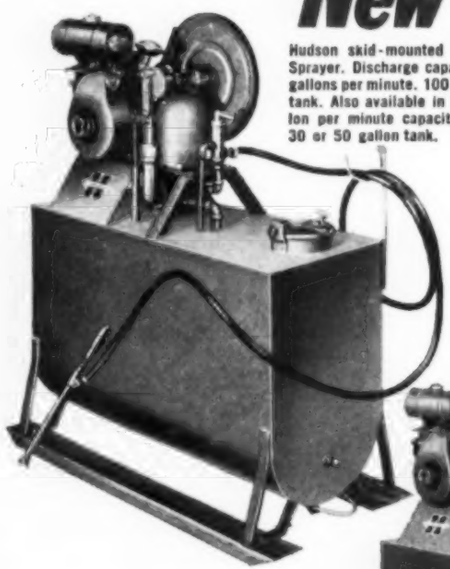

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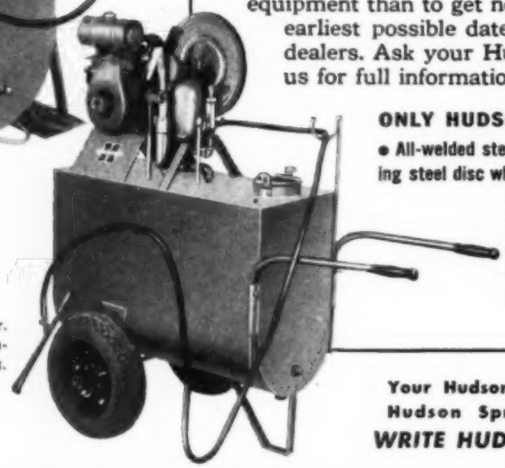
Hudson skid-mounted Power Sprayer. Discharge capacity 4 gallons per minute. 100 gallon tank. Also available in 2 gallon per minute capacity with 30 or 50 gallon tank.



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Hudson pneumatic tire Power Sprayer. Discharge capacity 2 or 4 gallons per minute. Available with 30 or 50 gallon tank.

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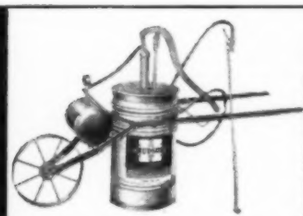

New

Hudson "Porta-Spray." 15 gallon capacity. With or without pressure tank. Steel, semi-pneumatic or full pneumtic wheels.

damage to the weeds. The sprays as well as the isopropyl ester dust with oil effectively controlled the weeds. The best control was secured with the triethanolamine salt in water. Next in order were "Esteron" and "Weedone." The oil sprays slightly injured the rice plants but they recovered quickly. Yields of the individual plots were not obtained but general observations and the yield of the treated areas as a whole, compared with untreated areas, indicated a definite increase in yield for the better treatments.

There was no appreciable wind during the application but it was necessary to discontinue treatments at 8:00 a. m. the second day when dusts were being applied. There was no observable drift of the sprays *at any time*. Tall indigo plants within 75 feet of the sprayed areas were not affected, nor were the sensitive weeds in the buffer strips left between treated plots. On the other hand, sensitive weeds in the buffer strip between dusted plots were injured but in general were not killed because of the rain. Dust clouds were observed to drift one-half mile from the treated field with a slight breeze when the treatments were discontinued. Coffee bean plants along a road a mile away from the dusted plots were injured by the dust.

Experimental trials in field plots at the Beaumont station and general observations of airplane applications in the vicinity indicate that 2,4-D can be used effectively for the control of weeds in rice fields without injury to the rice or to other crops in nearby fields. Successful results, however, depend on reliable information as to kinds of 2,4-D to use, rates and dates of application, and care to avoid injury to crop plants.

Experimental plot trials included treatments with the triethanolamine, ammonium and sodium salts, and the butyl ester of 2,4-D at the rate of 1 pound per acre in 50 gallons of water applied 3, 6 and 8 weeks after emergence of the rice. Butyl ester was also applied at ¼ and ½ pound rates and the triethanolamine salt at ¾ pound per acre at the last date. The principal weeds in these plots were Mexican weed, tall indigo and curly indigo which also are the common weeds in commercial fields.

Good control of the weeds was obtained with all forms of 2,4-D at all rates when applied 3 weeks after emergence of the rice. However, rice was definitely injured when treated at this time and yields were reduced by the ammonium salt and the butyl ester at 1 pound per acre. The triethanolamine preparation increased the yield. Yields for the other treatments were similar to those of the untreated or control plots. Good control of the weeds was obtained also with all materials and all rates 6 to 8 weeks after emergence except for the ¼ pound rate of the butyl ester. All treatments six weeks after emergence and the triethanolamine salt applied 8 weeks after emergence significantly increased the yield as compared with the untreated plots. All other treated plots yielded about the same as the controls.

—*Edgar C. Tullis, U.S.D.A.; in Texas Agri- Exper. Sta. progress report, #1115, March 29, 1948.*

DDT

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FRIANITE is as close to neutral as practical for general agricultural application. Superior adhesive qualities. Moisture is less than 1%. Bulk density is about 47 lbs. per square foot.

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FRIANITE *is shipped direct from our plant at Friant, California, in 100 lb. kraft bags. Superior qualities of* FRIANITE *make it economical to use all over the U.S.*

CALIFORNIA INDUSTRIAL MINERALS CO.

"Producers of FRIANITE" ★ **FRIANT · CALIFORNIA**

Experiment Station Digest

By H. H. Slawson

AIRPLANE dusting of apple trees with DDT failed to control codling moths and Pacific mites, a report from Washington state agricultural experiment station, Pullman, Wash., states. Five acres of trees were dusted at Wenatchee, in a study of this method of application, the dust formula used consisting of 20 percent DDT, 5 percent "DN 111" and 75 percent talc or clay. The trees were dusted five times during May, June and July, at the rate of 75 or 80 lbs. per acre. After it became apparent that control had failed, the dusting was discontinued. DDT sprays were then used twice and further worm damage was stopped, although some trees had 50 percent of the apples wormy when harvested. Causes for the failure of airplane dusting were not discussed in the brief progress report.

In another test airplanes were used to apply insecticidal spray on cherry orchards for control of cherry fruit fly. Rotenone extract, diluted with water, was found unsatisfactory, but when mixed with odorless kerosene the rotenone gave good results. However, it caused injury to ripening interplanted apricot trees and was discontinued in favor of dusting. Dust were succesful in commercial tests, cost less and caused no injury.

Tests conducted at Pennsylvania State College, State College, Pa., to determine if DDT is present in grape juice made from grapes that had been sprayed with DDT have indicated, says the station's 60th annual report, that "there is very little DDT present."

In South Carolina, where insect pests of cotton plants caused a loss to farmers of an estimated $7,000,000 in 1946, Clemson argicultural experiment station investigators have concluded that, of all the new organic insecticides recently developed, benzene hexachloride shows the most promise for control of boll weevil, cotton aphid and others.

Five extensive experiments were conducted to compare the effect of several insecticides applied as dusts against the boll weevil and cotton aphid. Of them all, says the station's 59th annual report, benzene hexachloride, applied at strengths varying from 1.0 to 5.75 percent of the gamma isomer gave almost perfect aphid control when mixed with an inert diluent, or with DDT. The BHC proved incompatible with calcium arsenate.

For boll weevil control the benzene hexachloride, at strengths of 1.0 to 5.75 percent of the gamma

What's Your Problem?

Aphid Spray
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Nicotine Base for Dust
•
Controlling Poultry Roundworm
(Ascaridia galli)
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1. The FAMOUS BLACK LEAF 40 — for spraying or dusting to control small sucking insects, plant lice, and similar pests. Also used to control external parasites of cattle, sheep and poultry—and as a drench for sheep.
2. BLACK LEAF 155 — for spraying apples and pears to control codling moth, also for controlling grape berry moth.
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5. BLACK LEAF 10 DUST BASE — meets the demand for a nicotine compound easily mixed with non-alkaline carriers to make a neutral dust.
6. BLACK LEAF CUNIC DRENCH — for sheep and goats. Formula recommended by U. S. Department of Agriculture.
7. BLACK LEAF POWDER AND PELLETS — for controlling the large roundworm (Ascaridia galli) in chickens.
8. MASH-NIC — for mixing with poultry feed to control large roundworm.
9. NICO-FUME LIQUID — for greenhouse spraying and fumigating — especially refined.
10. NICO-FUME PRESSURE-FUMIGATOR — spreads penetrating fumes under pressure — controls aphids and similar insects in greenhouses.

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LOUISVILLE 2 . . . KENTUCKY

isomer compared favorably with calcium arsenate, while mixtures of benzene hexachloride with DDT were more promising than the BHC alone.

DDT was rated "very promising" for control of many cotton pests and, from the standpoint of increased yield, the 50 percent DDT dust was the best treatment tested.

Soil fumigation tests were conducted at the Clemson station, using "D-D," a soil fumigant, for control of root knot nematode in tomato fields. Yields from treated plots were much larger than from untreated plots, but until certain points are clarified, no recommendation was made as to amount of dosage required per acre for effective control.

For control of rice weevils and varied other insects in stored corn and cowpeas a Clemson experiment brought the conclusion that 3 percent DDT dust, used at the rate of only ¼ oz. per bushel is sufficient for "very nearly perfect protection." Another compound, magnesium oxide, which has been recommended as a protective dust for stored seeds, was also tested on corn and cowpeas, but, according to the report, "gave no apparent protection, even at the highest rate used, which was 1 oz. per bushel." Germination of corn treated with magnesium oxide was reduced 25 to 37 percent.

•

1947 Onion-Mildew Control

Airplane dusting with copper-sulphur fungicides was not effective against onion downy mildew in the 1945 epidemic. Mildew did not reappear in 1946 and only yield data were obtained in effects of fungicides. Dusts and sprays were applied in 1947 to seeded Yellow Globe onions in a randomized block design with individual plots of four 30-ft. rows. The first application July 7 preceded mildew detection, but all plants in the untreated plots were infected at the time of the fifth and final application on August 17. Dusts were applied at 50 lb. and sprays at 204-272 gal. per acre. DDT supplemented all materials for thrips control and "Triton-1956-B" as detergent in all sprays. Spray treatments were: "Cuprocide," "Cuprocide-p. e. p. s."; "Cuprocide-Dowax"; "Cuprocide"-wettable sulphur; "Dithane HE-178"; "Dithane HE-178-p. e. p. s"; "Dithane HE-178-Dowax"; "Bordeaux"; "Bordeaux-Dowax"; "P. e. p. s."; DDT; Wettable sulphur; "Dow 606" (Zn-dimethyl-dithiocarbamate); "Dow 608" (amine salt tetrachlorphenol); "Dow 612" (1,4-dithio-cyano-butene); "Lime-sulphur-rosin." Dusts were: "Cuprocide-sulphur" and "Dithane HE 178." Effective mildew control with no apparent phytotoxicity was obtained with both dusts and with "Dithane," "Dow 612," and Bordeaux sprays. "Cuprocide" sprays controlled mildew but caused some injury. Significant yield increases from mildew control alone were: "Dithane" dust, 29 per cent; "Cuprocide" dust, 21 per cent; "Dithane HE 178," 17 per cent; "Dow 612," 12 per cent; and Bordeaux, 8 per cent. —Nelson, Ray. *Phytopathology*, January, 1948.

GEIGY NOW ADDS 3 NEW PESTICIDES TO THE LINE THAT MADE DDT FAMOUS

GY-BEN
(BENZENE HEXACHLORIDE)
A benzene hexachloride formulation containing 65 gamma isomer.
GY-PHENE-40
(CHLORINATED CAMPHENE)
A dust base containing 40% chlorinated camphene primarily for use in preparing dusts for cotton-pest control.
GY-COP "53"
(INSOLUBLE COPPER)
A chemically stable insoluble basic copper sulphate containing 53% metallic copper for use in preparing sprays or dusts.
Geigy

And don't overlook these widely used Geigy DDT compositions. They also represent opportunity to manufacturers and processors of packaged insecticides for the retail trade.

NEOCID* D-30

A solution containing 30% Geigy DDT (by weight) for dilution with liquids, to control flies, mosquitoes, bedbugs, cockroaches, fleas and certain other insects.

GESAROL* VD-50

A finely-ground powder containing 50% Geigy DDT. For general agricultural use after addition of diluents to formulate DDT dusts adapted to control specific pests.

Geigy Company, *"Originators of DDT Insecticides"* are now broadening their base of operation in the field of pesticides. These three new Geigy products have been tried and proven. They are of traditional Geigy quality. Use them with confidence in dust mixtures for agriculture. They will help you build business. Your inquiries are invited.

*Reg. U.S. Pat. Off. Insecticidal Compositions containing DDT are covered by Reissue Patent No. 22,922

GEIGY COMPANY, INC.
89 BARCLAY STREET, NEW YORK 8, N. Y.

ORIGINATORS OF DDT INSECTICIDES

INDUSTRY NEWS

Marks to 'Frisco Office

Innis, Speiden & Co., New York, has announced the transfer of George Marks to San Francisco where

GEORGE MARKS

he will be West Coast manager of insecticide sales. He was for nine years manager of the company's New England insecticide division, with headquarters in Boston. His former position will be filled by Joseph Lyons, formerly of the firm's New York office.

•

N. J. Mosquito Ass'n Meets

Louis B. Pierce, Trenton, N.J. was elected president of the New Jersey Mosquito Extermination Association at the group's 35th annual meeting at Atlantic City, April 13, 14, 15 and 16. Other officers named were as follows: Dr. Bailey Pepper, vice-president; Hendrick Van Brederode, first vice-president; Francis Stokes, second vice-president; Thomas D. Mulhern, secretary; George W. Eager, assistant secretary; and Lester W. Smith, treasurer. The retiring president, Dr. David L. Russell, Jersey City, automatically becomes a member of the association's executive committee.

The four-day meeting was devoted to the presentation of papers on mosquito control, with speakers from the U.S. Department of Agriculture; the Rutgers University Agricultural Experiment Station; various county control officials, and representatives of other states having mosquito problems similar to those of New Jersey.

An out-of-door demonstration of insecticide applicators featured the program for Wednesday, with a complete "show" of mist blowers, aerosols, fog generators, sprayers and dusters for mosquito control. A demonstration of airplane spraying was cancelled by the operators because of a strong wind which hampered to some extent the performance of the other devices.

•

Jamieson MIFI President

E. W. Jamieson was elected president of the Michigan Insecticide and Fungicide Institute at the group's annual meeting held at Michigan State College, E. Lansing, in January. Other officers named included Wayne A. LeCureux, secretary; Ken B. Garlinger, treasurer; Lowell McKinney, Charles D. Gafney, B. C. Manker, and Ray Hutson, directors.

Meetings

Western Chapter, National Shade Tree Conference, Santa Barbara, California, May 20-22.

American Plant Food Council Third Annual Convention, June 13, 14, 15, 16, White Sulphur Springs, W. Va.

Pacific Slope Branch, A.A.E.E., June 14, 15, 16, Hotel Vancouver, Vancouver, B.C.

National Fertilizer Association, Annual Summer Meeting, June 21, 22, 23, White Sulphur Springs, W. Va.

Eighth International Congress of Entomology, August 9-15, Stockholm, Sweden.

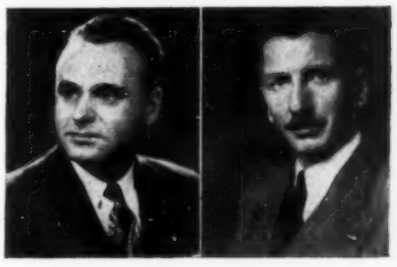
A.I.F. Association Fall Meeting, September 7, 8, 9, Spring Lake, N. J.

Economic Poisons Control Officials, Second Annual Convention, October 9, Shoreham Hotel, Washington, D. C.

Amer. Ass'n. Economic Entomologists, New Yorker Hotel, New York, December 13-16, 1948.

Wood & Hayley Advanced

Tobacco By-Products and Chemical Corporation, Louisville, Ky., have announced recent staff appointments involving Henry J. Wood and



MR. HAYLEY MR. WOOD

Denis Hayley, both of whom become assistant sales managers for the firm. Mr. Wood was formerly district sales manager for the northeastern area, and has been with the company since 1929. He is well known to the industry through his service on various committees of the A.I.F. Association

Mr. Hayley was formerly district sales manager for the north central states area. He has been with the organization since 1936. Both of the new appointees will make their headquarters at the Louisville office.

The company had earlier announced the election of George F. Leonard as executive vice-president and treasurer; and J. M. Merritt as sales manager.

•

"Fertilizer School" Held

The California Fertilizer Association has scheduled a "Fertilizer Salesman's School" which was announced to be held on April 29 and 30 at Riverside, Calif. Although the meeting place was scheduled for the southern part of the state, it was expected that numerous salesmen from the northern portion of California would be in attendance. Oliver E. Overseth, executive secretary of the association stated that some persons from Arizona were also expected to enroll.

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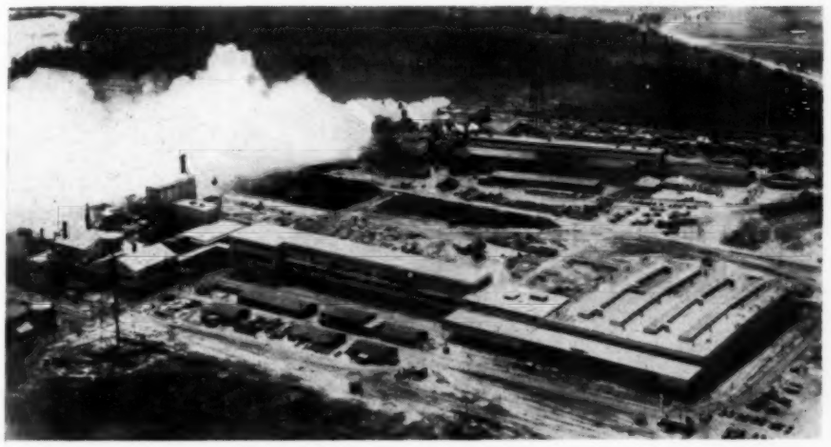

Airplane view of the St. Regis Paper Co., North Pensacola, Florida. In the foreground is the new Alabama Pulp & Paper Co., mill, with the new multiwall bag plant at the right. In the background is the Florida Pulp and Paper Co. mill. The integrated kraft paper operation is rapidly swinging into top production. The new Alabama mill, specially designed for the manufacture of heavy-duty kraft paper, has a rated capacity of 250 tons a day. Capacity of the Florida mill is about 200 tons of kraft paper daily, and the combined output of the two mills is sufficient to make 500 million multiwall bags annually. The entire unit is cited as an example of conversion from managed woodland, to pulp, to paper, to multiwall bags.

Mathieson Elects Nichols

Thomas S. Nichols was recently named president of Mathieson Chemical Corporation by the company's board of directors. George W. Dolan, formerly president, was made chairman of the board to replace A. U. Fox, resigned. John C. Leppart was elected vice-president. Other officers were re-elected.

•

New Supply Co. in Colo.

A new supply company to service dealers in Colorado, Wyoming and Nebraska has been opened at Eaton, Colorado. The firm, known as "Selco Supply Company" is headed by Sam C. McCampbell, formerly an entomologist with Colorado A & M College; Howard Lair, and Jerry L. Cress, operators of the Severence (Colorado) Elevator Company.

The new firm is an outgrowth of the Severence Co., which has served the three-state area for the past seven years as dust mixers and distributors of fungicides, insecticides and weed killers. The addition of Mr. McCampbell has made possible the present expansion.

Mr. McCampbell will supply technical field service, and will work in cooperation with agricultural agencies in the area. He will also make surveys of disease and insect pests and will help advise on control methods.

•

Canners Issue Warning

The National Canners Association, Washington, D. C., has issued to its members a warning on the hazards of new insecticides, asking the members to pass on to their growers the information concerning specifically, benzene hexachloride, chlordane, and parathion. The warning urges canners not to accept vegetables or fruits which have been treated with these insecticides. "Fieldmen should emphasize with growers not only the hazards of these new insecticides, but also the need for following insect control practices recommended by their own State entomologists," the bulletin concludes.

•

More Fertilizer to U. S.

American growers were to receive an additional 9,000 tons of ammonium nitrate fertilizer during the current season, according to arrangements recently made between the U. S. Department of Agriculture and the U. S. Army. The fertilizer, part of the tonnage produced in the U. S. for shipment to occupied areas, will be available to American farmers through normal commercial distribution channels. The exchange was to be made through the Commodity Credit Corporation.

The 9,000 tons now being borrowed will be pro-rated to fertilizer producers on the basis of the respective amounts of ammonium nitrate supplied by each for the 1947-48 commercial export program. The producers will take title to the material at army depots located at Grand Island and Fremont, Nebraska; Burlington, Iowa; Carbondale, Ill.; and Wayland, Ohio; or at the option of the army, from Theodore, Alabama.

•

"Fertilizer Review" Out

The March-April issue of *Fertilizer Review*, published by the National Fertilizer Association, features a study of the supply situation of trace elements. It states that while the demand for trace elements in agriculture is expected to increase to a considerable extent, suppliers will be able to meet any probable requirements. The article reviews the plants in the U. S. which are producing copper, manganese, zinc and boron, and presents numerous photos to illustrate. The trace elements article was written by Dr. J. K. Plummer, general manager of the Tennessee Corp., East Point, Ga.

Other articles in this issue of Fertilizer Review include one by Frank N. Fagan, State College, Pa., on apple tree nutrition; and another on the relation of soil to nutrition and health. Author of the latter article is K. C. Beeson, U. S. Dept. of Agriculture.

•

Wisconsin Fellowship

An industrial fellowship amounting to $6,300 for the study of insect control in stored pulpwood has been established by the Nepco Foundation, Port Edwards, Wisconsin. The fellowship is with the University of Wisconsin, Madison. The three-year research is scheduled to run until March 31, 1951, under supervision of the school's department of economic entomology headed by Dr. R. D. Shenefelt.

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VATSOL

WETTING AGENTS

Manufacturers who had the opportunity of using VATSOL in their insecticides and fungicides, know the excellence of these wetting agents. Now that wartime scarcities have eased, the following are again available.

VATSOL* OT 100%

In pellet form this grade resembles paraffine, is somewhat soft and plastic and non-hygroscopic. Its solubility in petroleum and vegetable oils and absence of water makes this the preferred grade for oil sprays and other liquid concentrates where water is an undesirable component. Although not an emulsifying agent VATSOL OT is a desirable additive material when used with an emulsifier in preparing a miscible, fast-breaking, mineral oil stock.

VATSOL OT 85%

A heavy, viscous paste composed of 85% VATSOL OT 100% and 15% water. This is excellent for use in preparing miscible oils and fruit and vegetable washes.

VATSOL OT 70%

Contains 70% VATSOL OT 100% plus a neutral solvent and water. Because of its fluidity and ready solubility in organic solvents it is especially useful in concentrated liquid insecticides. This grade is not intended for use as a vegetable washing agent but is excellent for bulb dips.

VATSOL OT 25% Aqueous

Contains 25% VATSOL OT 100% and 75% water. This grade may be added directly to the spray tank or reduced to 10% strength and added to spray or wash solutions. Ideal for washing fruits and vegetables or for spraying with insecticides such as lead arsenate or nicotine sulfate.

VATSOL OS

A yellowish brown powder hygroscopic in nature. It is especially suitable for addition to dry insecticides or fungicides which are applied in the dust form. VATSOL OS can be used in rotenone dusts for crops as well as those for cattle grub control. This material is also excellent in preparing wettable sulfur when grinding for either 325 mesh or micron-sized sulfurs.

Further information on use and cost will be promptly furnished upon request.

*Reg. U. S. Pat. Off.

AMERICAN CYANAMID COMPANY

Agricultural Chemicals Division

32-D Rockefeller Plaza, New York 20, N. Y.

NAIDM in June Meeting

The National Association of Insecticide and Disinfectant Manufacturers will meet at the Monmouth Hotel, Spring Lake, N. J., in a three-day convention, June 14, 15 and 16.

Speakers at the meeting are expected to include W. W. Peter, Office of International Affairs of the U. S. Department of Commerce; Dr. W. G. Reed, chief of the Insecticide Division, U.S.D.A.; E. G. Friedman, Bureau of Standards, R. H. Macy Co., New York; Dr. E. C. Bursk, Harvard Business Review, Boston; and representatives of the Food and Drug Administration and Federal Trade Commission. An insecticide symposium is included on the agenda, as are a number of movie films.

•

Issues New Info Sheet

The "Hornblower" will be heard no more. That is, the former publication of that name, issued monthly by the California Fertilizer Association, is now appearing in the "new look" under the name of "Plant Food Facts." A new cover has been designed for the house organ.

•

Westvaco Changes Name

A new name has been selected for the former Westvaco Chlorine Products Corp., New York. The firm is now known as "Westvaco Chemical Corporation," in order to delineate more accurately the expanding scope of the company's activities. The new name became effective on April 29, 1948.

The output of chlorine products will continue to be an important function, company spokesmen point out, but in addition, there is increasing volume in the manufacture of other chemical products. Among these are included numerous organic insecticides such as DDT and benzene hexachloride; cotton dust, methyl bromide, etc. Various sanitary chemicals are also included. Among these are dry cleaning and degreasing solvents, and a number of other specialty products.

New DuPont Fungicide

A new fungicide has been introduced by E. I. duPont de Nemours & Co., Inc., Wilmington, Del. The product, known as DuPont's F 531 Fungicide, is termed a "chromate complex of calcium, zinc, copper and cadmium" to control dollarspot, copper spot, and pink patch. The new fungicide is being added to the firm's list of other turf fungicides, including "Tersan," "Semesan." The material is an undiluted, green-colored, soluble powder which may be mixed with water and used as a spray. The fungicide is non-corrosive to metal in spray equipment, is odorless, and harmless to grass to which it is applied, if directions are followed.

•

N. J. Spray Program Heavy

Some 313,000 acres of New Jersey agricultural land were dusted or sprayed with airplane application during 1947, according to the N. J. State Department of Agriculture. There were a total of 2,070 applications of insecticides and fungicides.

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POWDERED TALC

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famous TEEJET SPRAY NOZZLES for WEED KILLING

• LIVESTOCK SPRAYING
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¼ T-650067 and many other sizes with interchangeable orifice tips . . . the farm famous nozzles for efficient low cost, low gallonage spraying of CONCENTRATES.

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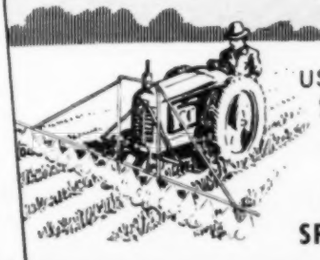
WRITE FOR BULLETIN 53



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ready for immediate shipment!

Rats eat or destroy 200,000,000 bushels of grain in this country yearly—estimated by a Government Service. This is enough to feed millions of Europe's hungry people.

The Government is spearheading a coast-to-coast campaign against our estimated 137,000,000 rats—the U.S. D.A. and U.S. Fish and Wildlife Service cooperating. County agents are organizing community campaigns.

A chief weapon to be used in this rat-battle will be ANTU. It is one of the most effective poisons known for the brown (Norway) rat—the most common species on farms and in towns of U. S.

In concentrations of 2 to 3%, ANTU is more readily accepted by rats than red squill. ANTU mixes evenly with baits of usual type—sticks to the feet and hair of rats when dusted in runways. It is somewhat toxic to dogs and pigs, but relatively non-toxic to most other domestic animals such as chickens, cats, etc.

ANTU is a finely granulated gray powder—insoluble in water but slightly soluble in some organic solvents including ethyl alcohol, acetic acid, dioxane.

Prepare to meet the demand for ANTU rat-killers which will result from the nation-wide campaign. Baker can supply manufacturers with ANTU for immediate delivery. Send today for details and prices.

Write for our free bulletin which gives valuable facts on ANTU. Address *Agricultural Chemical Division,* J. T. Baker Chemical Co., 66 South Main St., Phillipsburg, N. J.

Baker's Agricultural Chemicals

Fraser to New Position

The Naugatuck Chemicals division of Dominion Rubber Co., Ltd., Elmira, Ontario, has announced the appointement of Donald D. Fraser as sales manager for the western div-

DONALD D. FRASER

ision of the company. He was formerly technical sales representative in the western territory. Mr. Fraser is a graduate of the University of Manitoba, and has been representing Naugatuck Chemicals in the agricultural field in the west since 1946.

•

Monsanto Files Big Suit

Monsanto Chemical Co. has filed suit in the U. S. District Court of Galveston to recover damages from the U. S. Government in the amount of $50,000,000 as a result of the explosions at Texas City last year. The company claims that the government, by reason of its large manufacture of ammonium nitrate for military explosive purposes, had knowledge of the potential hazards of the material, and is therefore responsible for the explosions of two ships, the S.S. *Grandcamp* and the S.S. *High Flyer*. The ammonium nitrate which exploded aboard the two ships had been manufactured, packed and shipped from three Ordnance Department plants owned by the U. S. Government at Iowa and Nebraska locations. The material had been produced and packed in accordance with U. S. Government specifications and instructions and had been shipped under government bills of lading, the plaintiff points out.

Monsanto also states that the ammonium nitrate granules were coated with a waxy material and packed in paper bags containing asphalt interlayers, all of which increased the combustibility of the product and heightened the possibility of fire and resulting explosion. The company maintains that, although ammonium nitrate was known to be highly explosive and had been used during the war in making amatol, which was the bursting charge for bombs and shells, the same material shipped in this case was innocently labeled as "fertilizer." The Government had placed no warnings or precautionary notices on the bags or shipping documents so that persons handling the material would be informed of the highly explosive and hazardous contents. At the same time, the company says that no instructions to avoid fire or for fire fighting methods were carried on the bags.

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MAGNETIC "70" SULPHUR PASTE

A freeflowing product containing 70% Sulphur. No pre-mixing required. Quick setting and extremely adhesive. Particle size—4 to 5 microns.

MAGNETIC "95" DRY WETTABLE SULPHUR

For growers preferring a dry wettable Sulphur. Readily Wettable. Disperses well without excess foaming. Particle size—4 to 5 microns.

MAGNETIC "90" DUSTING SULPHUR

Particle size—4 to 5 microns, insuring good coverage.

STAUFFER INSECTICIDE CONCENTRATE No. 50-20

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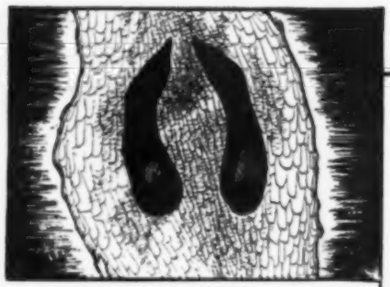

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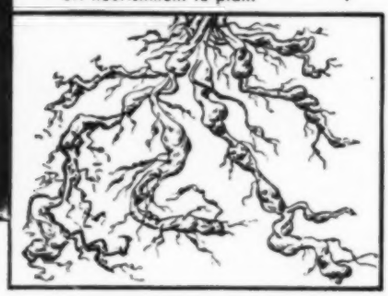

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TEPP in Demonstration

A demonstration of tetraethyl pyrophosphate aerosols was held at Westlake, Ohio on April 14, Dr. Floyd F. Smith, U.S.D.A., Beltsville, Md. conducted the demonstration before a gathering of some 150 persons, to show the effect of the material on red spider and other pests of tomatoes and cucumbers.

•

New Name for SW DDT Co.

Southwestern DDT Corporation, Llano, Texas, has changed its name to "Agricultural Chemicals, Inc.," in order to designate it in a more comprehensive manner, according to O. C. Behse, president of the firm. The company has recently enlarged its main plant in Llano, and has established additional branch plants at Pecos, Texas and at Torreon, Coah., Mexico. Among its products are insecticides, fungicides, livestock sprays, dips, defoliants, weed killers, and fumigants.

•

Am. Potash & Chem. Report

American Potash & Chemical Corp. reports an all-time high in production and sales in its annual report for 1947. Earnings showed a gain of 39 per cent over 1946. Net income for the calendar year of 1947 totaled $2,106,319, or $3.60 a share, against $1,514,105, or $2.87 a share in 1946. Total production of primary chemicals at the Trona, Calif. plant was 594,764 tons against 541,327 tons in 1946.

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Mist Blower School at Conn. Agri. Exp. Station

Photos taken at Connecticut Agricultural Experiment Station, New Haven, during "Mist Blower School" held March 24 and 25. Top row, Accurate Universal Insect Control unit of Newark, N. J.; and demonstration by Davey Tree Expert Co., Old Greenwich, Conn. Second row from top: H. P. Starner blower, Scarsdale, N. Y.; Wheelbarrow sprayer by Dr. F. S. Potts and R. A. Spencer, U.S.D.A., New Haven; and Lawrence Aero Mist blower, Greenfield, Mass. Third row from top: John Bean blower, Lansing Michigan; Buffalo Turbine blower, Gowanda, N. Y.; and another Buffalo machine. Bottom row pictures another Lawrence Aero-Mist machine; another Bean machine, a sprayer-duster with 4-hole outlet; and entry by Greenfield Sprayer Co., Greenfield, Mass.

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The considered opinion of these committees is made available to A.I.F. members through its bulletin service.

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APFC Entertains Radio Editors at Luncheon

Members of the National Association of Radio Farm Directors were guests of the American Plant Food Council at a luncheon at the Carlton Hotel, Washington, D. C., April 27. Clifton A. Woodrum, (center) president of the Council, outlined the aims and purposes of his organization and paid tribute to the outstanding job being done by radio spokesmen for agriculture. At the head table at the luncheon are (left to right): Ken Gapen, chief, Radio Service, U.S.D.A.; Hal Totten, WGN, Chicago, secretary of the NARFD; Mr. Woodrum; Charles A. Worcester, WMT, Cedar Rapids, Iowa, NARFD president; Keith Himebaugh, chief, Office of Information, U.S.D.A., and Donald G. Lerch, director of agriculture, Columbia Network.

—Photo Courtesy American Plant Food Council

Pacific Slope Meeting

Plans are well under way for the meeting of the Pacific Slope Branch of the American Association of Economic Entomologists, to be held June 14, 15 and 16 in Vancouver, British Columbia. Dr. E. J. Newcomer, Yakima, Washington, chairman of the program committee has announced the names of speakers invited to appear on the program as follows: Dr. R. L. Webster, State College of Washington; E. A. McGregor, U.S.D.A.., Whittier, California; H. H. Keifer, California Dept. of Agriculture, Sacramento, Calif.; R. W. Burrell, U.S.D.A., Yakima, Washington; Dr. Lee Jeppson; A. E. Michelbacher, University of Calif. Agricultural Experiment Station, Berkeley; and Irwin Newell, University of Oregon.

A symposium on new insecticides is planned to be held, with four prominent persons appearing on this program. These include S. A. Rohwer, assistant chief of the Bureau of Entomology and Plant Quarantine, U.S.D.A., Washington, D. C. and president of theA.A.E.E., who will carry out a general discussion on the subject. W. A. Ross of the Canadian Department of Agriculture will tell of experimental work on new insecticides in Canada; Dr. J. G. Horsfall, American Cyanamid Co., New York, will speak on Parathion; and Allan B. Lemmon, California Department of Agriculture, will speak on the regulation of new insecticides.

The committee announces that H. G. Crawford, entomologist for the Dominion of Canada, has been invited to speak on a subject of his own choosing.

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- Organic Insecticides, Fumigants and Agricultural Chemicals including DDT, Benzene Hexachloride, 3-5-40 Cotton Dust, Soilfume*, Methyl Bromide, etc.
- Commercial Sodium and Potassium Phosphates
- Dry Cleaning and Degreasing Solvents, Fire Extinguisher Fluid, Hydrogen Peroxide and many other specialty products and newly-developed chemicals.

New operations at Westvaco, Wyoming still further expand our mining and processing activities to include Soda Ash and related chemicals. Developments now under way at Pocatello, Idaho will integrate our phosphate output through substantial production of Elemental Phosphorus.

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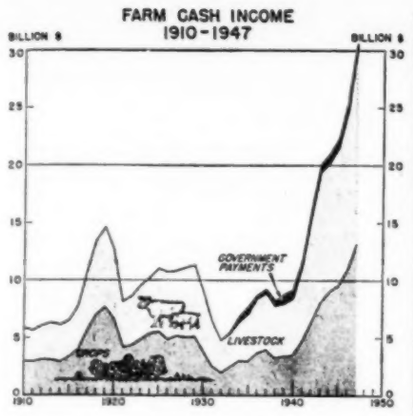

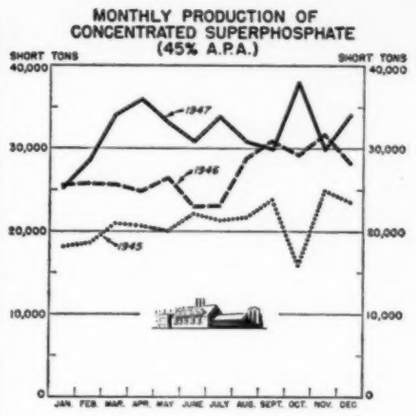

As shown in the charts above, both farm income and fertilizer production in the U. S. have risen to unprecedented heights. On the left, farm cash income is shown to increase to an all-time level of 30.5 billion in 1947. Compared with 1919, when farm income reached its peak after the First World War, farm cash receipts for 1947 were twice as great. Compared with 1935-39, the increase for 1947 was over three and one-half times as great.

Production of concentrated superphosphates by seven privately-owned plants reached a total of 384,000 short tons, on the basis of 45 percent available phosphoric acid. This production accounted for over 9 percent of total 1947 superphosphate production, on an 18 percent APA basis. Compared to the 322,000 tons reported for 1946, this production was 19 percent greater. The increase over 1945 output was 53 percent. The chart above shows monthly production during 1947 as compared with that for 1945 and 1946. It is plainly shown that production varies from month to month, and that there is no seasonal pattern. During 1947, production for all but three months was higher than for the same month in the preceding year.

—Graphs Prepared by Natl. Fertilizer Ass'n

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Grasshopper's Big Diet

Wyoming Agricultural Experiment Station, Laramie, has produced some interesting figures on the amount of good livestock feed eaten and destroyed by grasshoppers. The insects were caged and their consumption of forage and grasses measured.

When there was a population of 15 to the square yard, says the station's annual report the grasshoppers ate at the rate of 406 pounds to the acre. When there were 25 to the square yard forage consumption was 489 pounds per acre and at 35 to the square yard consumption rose to 792 pounds per acre. "This rate of consumption," observes the report, "is almost as much or more than the amount of forage normally produced each year on the mixed prairies."

New GLF Departments

G. L. F. Exchange, Ithaca, N.Y., has announced a reorganization of its "Soil Building " department, which places all operations in farm chemicals, except limestone and minerals, into a "Pesticide and Farm Chemicals" division, with P. J. McManus as manager. All research and quality control functions have also been withdrawn from operating departments and grouped into a new "Research and Quality Control" de-

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partment with J. C. Crissey as chairman and Wm. Tucker as head of the laboratory. A research and advisory committee has likewise been created to correlate operating departments and the research quality control program.

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ACS in Chicago Meeting

The 113th meeting of the American Chemical Society was held in Chicago, April 19-23. The role of chemistry in correcting the world-wide food shortage was discussed at length by a number of speakers who asserted that the proper use of chemicals in agriculture can stop much of the heavy losses of food sustained each year through insects, parasites and weeds. These rob the country of enough food annually to support a sizeable European recovery program, it was declared.

Addressing a symposium on food technology, Drs. Roy E. Hansberry and S. C. Dorman, of the Shell Chemical Corp., Modesto, Calif. stated that of the insecticides developed in recent years, at least ten of them are "as good as DDT and even better for some purposes." They continued by describing insecticides, fungicides, weed killers, rodenticides and other agricultural chemicals as being of utmost importance in the production of more food.

"The new chemical techniques," they said in concluding their discussion, "are so cheap they can be used economically on such low-profit crops as grain, hay and cotton. Improved insecticides can also be applied so cheaply that they may be soon used to preserve forests and thus create a stabilized lumber industry."

Recent progress in spreading insecticides as fogs on a large scale at relatively low cost was reported in a paper by Prof. Victor K. LaMer of Columbia University and Dr. Seymore Hochberg of E. I. du Pont de Nemours & Co., Wilmington. Complete control of diseases carried by mosquitoes and black flies, they said, can now be achieved by blanketing large areas with fogs containing DDT.

Under favorable conditions, their paper stated, all mosquito life has been destroyed for more than a mile downstream from the fog generator, with an outlay of only one pound of insecticide for every five acres of open country.

At Lake Placid, N. Y., black flies were completely eliminated for the summer season over an area of 200 acres around the Lake Placid Club, by DDT fog which lingered in the woods overnight. Accomplishments in other areas around the world, where insects cause serious human disease and discomfort were also reviewed.

The key to the new technique is close control over the size of the individual droplets which make up the fog, the report declared. The ideal droplet size was found to be about ten microns (4 ten-thousandths of an inch) in diameter, the report stated, and continued:

"If the droplets were much larger, like spray droplets, they would fall to the ground too quickly. On the

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other hand, if they were too small, they would be caught in the tiny air currents that surround each mosquito and would flow around the insect without depositing on it. The mosquito would be protected by its streamlined figure. To do its work, the aerosol droplet containing DDT must actually be deposited upon the insect's body.

In a symposium on aerosols, this problem of controlling droplet size was further discussed by Dr. LaMer, Dr. David Sinclair of the Johns-Manville Co., Manville N. J., and Irwin Wilson of Columbia University, New York.

Smoke screen generators in use before the war, this report said, produced droplets which were too small and also destroyed the DDT with heat. In a new generator, invented by Dr. LaMer and Dr. Hochberg, superheated steam catches and disperses droplets of oil containing insecticides by passing the mixture through a tiny aperture.

All droplets thus produced are of uniform size and for this reason the aerosol decomposes white light into red and green bands, the pattern for which is characteristic for each droplet size, the report said. This effect, known as the high order Tyndall spectrum, permits rapid and accurate determination of the size of the droplets or particles in any smoke or fog it was explained.

A new cheap method for producing carbon disulfide, which is essential for manufacture of soil disinfectants and other products, was described by Dr. C. W. Siller of New Jersey Zinc Co., Palmerton, Pa. In the new method, as he described it, sulfur dioxide is piped into a tube packed with hard coal and heated to more than 1,000 degrees, Centigrade. More than 90 percent of the sulfur dioxide, he asserted can be converted to carbon disulfide, and if carbon monoxide is burned to furnish heat for the reaction, the process can be made continuous and automatic.

In another recently developed process for manufacturing carbon disulfide, a cheap source of electricity is necessary for economical operation, he stated. This factor alone often determines the site of the plant. But if the new method is used much greater latitude is allowed in selection of a factory location. In the present commercial process for making carbon disulfide the raw materials are elemental sulfur and a reactive form of carbon, he pointed out and added that the process described in his paper should find acceptance in locations where either or both of these raw materials are not plentiful.

Internat'l Meeting in Aug.

Most of the plans have been made for the 8th international Congress of Entomology to be held in Stockholm, Sweden, August 9-15, 1948, although at press time the list of speakers and their topics was not yet available.

The Congress is scheduled to open at 10 a.m. Aug. 9 at the Stockholm Concert House. Registration fee, including the Proceedings and transactions will be 50 Swedish Kro-

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ner (about $15) ; or a fee of 30 Kroner without the proceedings and transactions. The opening day's program will include addresses by the Swedish minister of education; the president of the Congress; its secretary; and representatives of foreign delegates. The following days will of course feature the presentations of entomological papers, and various discussions. On August 13 the members of the Congress will be divided into 3 sections according to choice.

BHC EXPERIMENTS

(*Continued from Page 33*)

proved more effective than either brand "A" or brand "B" used at 2 pounds to 100 gallons.

BHC Kills Immature Stage

THE end result—wormy drops per tree— does not show how benzene hexachloride prevents wormy drops. It may kill the adult by contact, stomach poison or both; it may repel the adult or it may kill the eggs or larvae or both after they are in the peaches. Observations and data indicate that the principal mode of action of BHC is killing the immature stages (probably the larvae) in the peach.

Observations between the shuck split spray and the second spray ten days later indicated that the benzene hexachloride had little effect after two or three days in preventing curculio attack. The intensity of curculio attack between the shuck split spray and the second spray was more pronounced on the BHC plots than on the lead arsenate plots. Furthermore, the collection of adult curculio on sheets under the sprayed trees indicated no greater kill with the benzene hexachloride than with the lead arsenate-lime. Yet, at the first collection of drops the lead arsenate sprayed trees averaged over 100 wormy drops per tree whereas the best BHC plots averaged less than one wormy drop per tree and the poorest BHC plot averaged less than five wormy drops per tree.

The evidence indicated that curculio eggs or larvae or both were being killed by the BHC in the fruit. To obtain data on this point the following two experiments were run.

Experiment 1

A LARGE bouquet of peach twigs bearing peaches ½ inch in diameter was collected from an orchard in central New Jersey where no sprays of any kind had been applied and where curculio was extremely light. This bouquet was caged and approximately 100 curculio adults were jarred from trees in the experimental orchard at Glassboro and introduced into the cage. They were allowed to feed and deposit eggs for a period of five days after which the bouquet was divided into three small bouquets. These were placed in peach trees and one was sprayed with benzene hexachloride, one with hexaethyl tetraphophate and the third was left unsprayed to serve as a check. The sprayed bouquets were allowed to remain in the sprayed trees for about 8 hours and then returned to the outdoor insectary where they were allowed to remain for a week. At the

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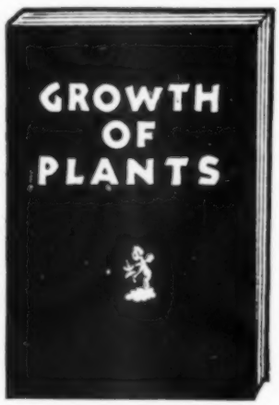

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end of the week all the peaches in each of the three bouquets were dissected and the percentage wormy peaches determined. The results of this experiment shown in table 5.

TABLE 5

Results from spraying peaches infested with curculio larvae with benzene hexachloride and hexaethyl tetraphosphate.

Treatment	Total Peaches	No. Peaches Wormy	% Peaches Wormy
Untreated	35	10	28.5
HETP	34	6	17.6
B.H.C.	21	0	0.0

The data in table 5 show that 28.5% of the peaches in the untreated check were wormy, 17.6% in the HETP sprayed peaches and none in the BHC sprayed peaches.

Experiment 2

ANOTHER method employed to determine whether BHC was killing immature stages of the curculio in the fruit was to spray dropped fruit under lead arsenate sprayed trees, which was practically 100% wormy, with BHC and compare larvel emergence from the BHC sprayed drops with larval emergence from drops not sprayed with BHC. On June 9 the dropped fruit under several trees of the Elberta variety and several trees of the Summercrest variety were sprayed with Brand "A" BHC at the rate of 2 pounds to 100 gallons. The following day approximately 400 fruits were collected from the sprayed ground from each variety. A like number was collected from under trees where the dropped fruit and ground had not been sprayed. The several lots of drops were caged in such a manner that the emerging larvae could be collected and recorded over a period of several weeks. The results are set forth in table 6.

TABLE 6

Curculio larvae emerging from dropped peaches unsprayed and sprayed with benzene hexachloride.

Variety	Treatment	No. Peaches	No. Larvae Emerged
Elberta	Check	387	319
Elberta	B.H.C. sprayed	391	38
S.Crest	Check	400	285
S.Crest	B.H.C. sprayed	400	66

The data in table 6 show a marked reduction in the number of larvae emerging from drops sprayed with BHC as compared to drops not sprayed with BHC.

In addition to the experiments outlined above, a considerable number of stung peaches were dissected at varying dates after the peaches had been sprayed with BHC. It was easy to find dead larvae in the BHC sprayed fruit but not in the unsprayed fruit.

More BHC Experiments

ADDITIONAL experiments comparing BHC with lead arsenate were run in an orchard in Middlesex County, New Jersey. In these experiments brand "B" was used at 3 pounds to 100 gallons water with wettable sulfur. Also the experimental BHC carrying 20% benzene hexachloride was used at 5 pounds to 100 gallons of water with sulfur. For

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comparison, a plot was left unsprayed except for sulfur and another plot with lead arsenate, lime and sulfur. This gave a four plot set-up, each plot consisting of five rows running across ten varieties in the orchard.

In this particular orchard curculio had never been very serious. Therefore, only two spray applications were made. The first spray was applied when the husks were three-fourths off the peaches on May 26th. The second spray was applied one week later on June 2nd. Dropped peaches were collected from each of ten trees in each plot for a period of five weeks beginning on June 5th, three days after the completion of the second spray. The results, expressed as wormy drops per tree, are set forth in table 7.

TABLE 7

Comparative effectiveness of benzene hexachloride and lead arsenate in preventing wormy peaches.

Plot No.	Treatment	Wormy Drops per Tree
1	5# Experimental B.H.C.	2.4
2	Check	181.0
3	L.A. 2#, lime	65.0
4	Brand "A" B.H.C. 3#	3.4

The data in table 7 are in line with and corroborate the data in table 3. The reduction in wormy fruit by both benzene hexachloride programs (table 7) was in the neighborhood of 98% over the absolute check. The reduction in wormy drops by the lead arsenate program was approximately 65 per cent.★★

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Triethanolamine Salt
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Manufacturers of Basic Agricultural Chemicals

AMMONIUM SULFATE

(*Continued from Page 29*)

representative, of course, of salt after the dryer.

The crystals classified as small in Table I are the smallest crystals ever recorded for this particular saturator. They were produced for demonstration purposes using an enormous amount of reheat while working down mother-liquor at a rate of 12,000 gallons per day and crystallizing at a rate 60 per cent above the design capacity of the unit. Even these smallest crystals contained only 2.2 per cent through a No. 70 sieve. The British and German specifications allow 5.0 per cent through a No. 70 U. S. sieve. This shows that the smallest crystals produced are able to meet Type I specifications with ease from the standpoint of crystal- size.

The salt classed as large in Table I should be satisfactory since the largest crystals are no longer than about 4.0 millimeters. The largest crystals produced in the saturator (not included in the table), containing 86 per cent on an N. 30 sieve, might be objectionable when based on present knowledge because the largest individual crystals had a ratio of length to diameter of about three to one with a maximum length of about 6.0 millimeters.

Competitive Nitrogen Sources

MOST of the competitive products, such as ammonium nitrate, are more hygroscopic than ammonium sulfate when the free-acid content of the sulfate approaches zero. Table II shows the hygroscopic points of various fertilizer salts.

An active competitive material at present, for direct application to the soil, is ammonium nitrate. This particular salt is much more hygro-

scopic than ammonium sulfate and loses its free-flowing qualities quite rapidly at relative humidities of about 60 per cent. The producers of ammonium nitrate are attempting to retain free-flowing qualities by improving crystal-size, by addition of conditioning agents and water repellents, and by storage in moisture-proof bags. Ammonium sulfate producers can meet ammonium-nitrate competition most effectively by working toward a dry, neutral, uniformly-sized salt with about 50 to 75 per cent by weight of the crystals on a No. 30 U. S. Standard sieve for the optimum in drillability.

2,4-D HEARINGS

(*Continued from Page 41*)

regulations which require a 500 ft. altitude, but that the C.A.A. issues waivers which authorize such operations, with special provisions. He said that the C.A.A. must approve of any alterations of a plane, including the adding of dusting or spraying equipment. These approvals are given from the standpoint of how such equipment will affect the plane's flight, rather than from any other consideration.

Mr. Chamberlain stated that the C.A.A. regards regulations for dusting as a legal problem, since there are no specific rules which cover dusting. Other than making sure of the plane's condition and seeing that the pilot is commercially registered to work for hire, the C.A.A. has no authority to control the type of material carried in the hopper. Further regulations are under consideration, but the matter is moving slowly to avoid errors. It was pointed out that the C.A.A. operates in two divisions: the C.A.A. Board, of a judicial nature, passing on economic and safety regulations. The C.A.A. Administration takes care of actual enforcement of regulations and checking craft against standards.

Representative Thompson suggested that planes applying 2,4-D should be permitted to make low-level flights, and that the C.A.A. should be informed where, when and what material is to be used. It should also be sure that the pilot is aware of the drift dangers involved.

In answer to Mr. Thompson's question whether or not the C.A.A. Board requires indemnity bond for fliers, Mr. Chamberlain stated that the board has not had the power to do this. The C.A.A. attorney also stated that it is doubtful that the C.A.A. has the authority to stop planes from "dumping" 2,4-D dusts, providing other conditions were met.

The April 21 meeting was the first Congressional hearing to discuss the subject of 2,4-D as applied from planes. No definite announcements for future meetings had been made as this issue went to press.

NFA CONVENTION

(*Continued from Page 47*)

the National Fertilizer Association; Weller Noble, chairman of the NFA board of directors, Pacific Guano

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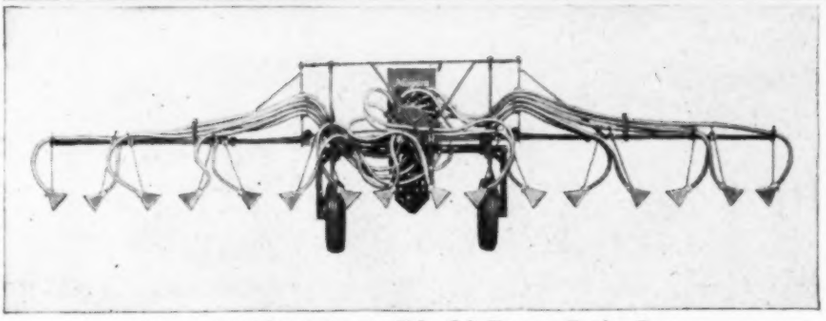

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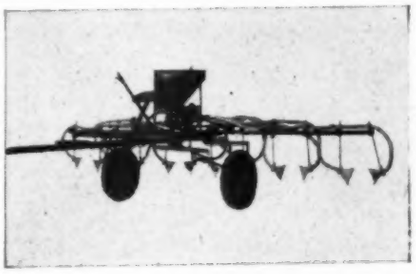

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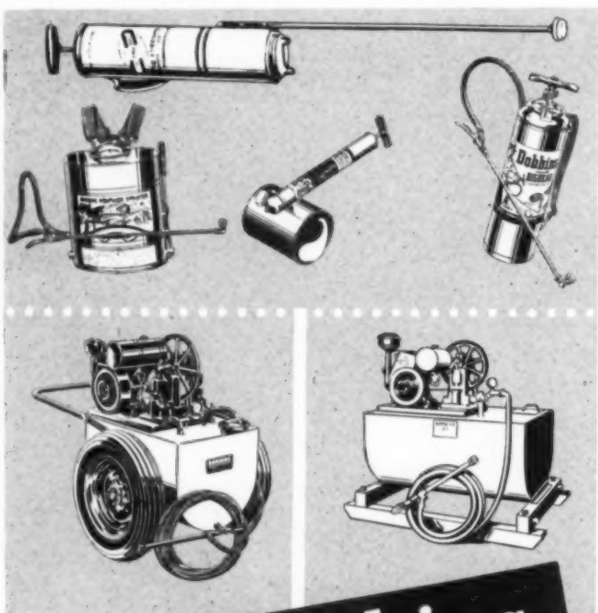

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Company, Berkeley, California; Hon. A. L. M. Wiggins, Under-Secretary of the Treasury, Washington, D. C. Wheeler McMillen, Editor-in-Chief, the *Farm Journal*, Philadelphia, Pennsylvania; Dr. Robert E. Yoder, chief, agronomy department, agricultural experiment station, Wooster, Ohio; and Howard W. Selby, general manager, United Farmers of New England, Charlestown, Massachusetts.

In addition to the formal business sessions, the Association has arranged for ample recreation for its convention attendants. The golf committee is headed by A. L. Walker, Jr., chairman, and consists of these members: T. E. Bradley, Ray King, C. E. Lightfoot, John A. Miller, and J. W. Rutland. There is also a functioning committee on tennis, headed by chairman James Cope.

The NFA states that a large attendance is anticipated at its 23rd annual convention.

•

Decisions Favor Velsicol

Decisions in two patent suits instituted by Velsicol Corp., Chicago, against Julius Hyman & Co., Denver, have been made in favor of the Chicago firm. The first trial held before Judge W. A. Black in the District Court, City of Denver, ended on April 21. In each action, Velsicol sought damages from a series of defendants, including Julius Hyman, president of the defending firm, because of alleged wrongful use of trade secrets belonging to Velsicol Corp.

Litigation between the two firms, following the recommendation of a Master in Chancery, is reported to have been decided in favor of Velsicol in a federal district court hearing in Chicago. At press time, the text of the court's decision was not available.

In a statement following the court rulings in both Denver and Chicago, Dr. Hyman said: "There will be no interruptions in the production and marketing of 'Octa-Klor' brand technical chlordane." In a later statement the Hyman Company added, "Our legal counsel have again assured us that those who buy and use 'Octa-Klor' will incur no liability whatever."

2,4-D IN CORN

(*Continued from Page 27*)

weeds will be killed. Planting on beds or ridges offers similar difficulties.

Other Methods

WHERE 2,4-D pre-emergence treatment proves hazardous or fails, there is still another method which though more laborious, may prove useful. In the earlier publication (Crafts and Raynor, 1944) diesel oil, and fortified diesel oil were recommended. These materials have been used in large quantities in vegetable growing in the West and have proved satisfactory. Their principal drawback is their high cost, and the temporary nature of the control effected.

During some recent studies on weed control in sugar cane in Puerto Rico, a new formula has been evolved for a fortified oil emulsion contact spray that should prove considerably more economical than straight or

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- "What the Dealer should know about Fertilizers"
- "Future Prospects for 2,4-D"
- "Use of Lead in the Insecticide Industry"
- "What the Dealer should know about Fungicides"
- "The American Potash Industry"
- "Application Equipment for Pest Control"
- "Use of Molybdenum in Fertilizer"
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George S. Langford, Editor
College Park, Maryland

fortified oil (Crafts. 1948a). In preparing this spray, 30 pounds of a medium weight aromatic oil, 2 pounds of pentachlorophenol and 2 pounds of "Oronite" stabilizer are mixed until a uniform solution is obtained. This concentrate is emulsified by pouring into it 96 gallons of water, the first addition of water being slow and with violent agitation. This makes enough emulsion for an acre and it will kill any green vegetation to which it is applied.[4] One pound of dinitro secondary butyl or amyl phenol can be substituted for the pentachlorophenol if desirable.

This material is first used as a pre-emergence treatment 1 to 2 days before the crop comes up. A second spray is applied when the crop is about 12 inches high, care being taken to keep the nozzles low and avoid spraying the tops. Where a power rig is used, shields may be employed to protect the crop much as they are in cultivation. A third spray when the crop is 2½ to 3 feet high should complete the weeding. If wild morning glory is abundant in the field inclusion of 1 pint of an ester formulation of 2,4-D or 1 pound of 2,4-D acid per 100 gallons of spray will keep it in check. This combination spray has proved extremely effective in sugar cane and corn. Where only 2,4-D susceptible weeds occur, 2,4-D can be used for all weeding, but experience indicates that such situations are rare. Continued use of 2,4-D in cane has actually been found to increase the infestation by grasses through destroying competition.

Although 2,4-D may become widely used as a pre-emergence treatment in corn, there are several situations in which a program of contact spraying may be better. If 2,4-D treatment fails to do a clean job, due to unfavorable weather or a rough cloddy seed bed, the contact spray can be safely used in corn 1 foot or more in height without adding to the hazard of 2,4-D toxicity through the soil. Where, because of prevalence of grasses, poor seed-bed preparation, or the use of some of the less resistant varieties of corn, 2,4-D is not advisable, contact spraying can be done.

Where erosion is a problem, contact spraying should be superior to either cultivation or 2,4-D treatment because a low cover of weeds can be allowed to grow and then these can be sprayed, leaving an organic cover on the soil with the channels of the disintegrated roots to foster drainage.

Recent work in California emphasizes the benefits of pre-emergence sprays in sugar beets using fortified oil emulsions (Bobbins and Bainer, 1947). Trials in sugar cane indicate that such emulsions will prove useful in that crop. Field tests have proved that water soluble toxicants such as "Sinox" can be used on vegetable crops only in rain-free regions, and greenhouse experiments indicate that highly aromatic oils may injure young seedlings of both crops and weeds. At present it seems that diesel oil, diesel oil fortified with water insoluble toxicants and fortified oil emulsion sprays containing only water insoluble toxi-

[4] This emulsion is designed to kill young weeds in sugarcane, corn, and similar crops. For killing older weeds in crops, use 6 gallons of concentrate per 100 gallons of finished emulsion; on resistent weeds of roadside, etc., use 8 gallons of concentrate.

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cants are safe to use. In the use of 2,4-D as a soil amendment in pre-emergence weed control, any form that is available and toxic to weeds may also become available to the crop and is therefore hazardous. Whereas the dosage required to control weeds in the absence of weedy grasss may be low enough to provide a wide factor of safety, where grasses are abundant such treatment should be tried with a good deal of caution. Where 2,4-D cannot be used, a fortified oil emulsion spray may prove helpful.★★

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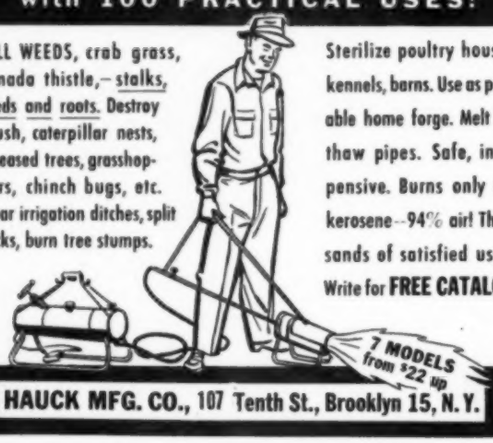

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Industry Patents

The following patents have recently been issued by the U.S. Patent Office on products and devices in the agricultural chemical field. Copies of the patents may be obtained at 25c each by addressing the U.S. Patent Office, Washington 25, D.C.

2,436,132. FERTILIZER DISTRIBUTOR. Patent issued February 17, 1948, to Charles H. White, Miline, Ill., assignor to Deere & Co., Moline. In an agricultural implement having a furrow opener and lifting means therefor, the combination with a fertilizer distributing mechanism including a base and a flexible fertilizer tube extending downwardly to said furrow opener, of a spout construction carried by said base for delivering fertilizer from said mechanism to said tube, comprising separable parts, said tube being connected with one part, and means whereby said one part is connected with the other part so as to be movable generally vertically and laterally away from the other part by generally upwardly directed force exerted thereon through said tube so that if, when said lifting means is actuated, said tube does not flex, said one part moves away from the other to accommodate said tube being lifted bodily with said furrow opener.

2,438,204. NITRATION APPARATUS. Patent issued March 23, 1948, to James B. Castner, assignor to E. I. duPont de Nemours & Co., Inc., Wilmington, Del. A nitration apparatus for the nitration of liquids wherein the reaction occurs at the interface of the acid and liquid to be nitrated, which comprises a reaction vessel, an elongated vessel of lesser diameter open at both ends, a mechanical agitator positioned to revolve within said elongated vessel, a shaft supporting said agitator, a plate above the upper open end of said elongated vessel, a second mechanical agitator above said plate, and an inlet pipe opening substantially at the lower open end of the said elongated vessel.

2,438,370. INSECTICIDE. Patent issued March 23, to Allen H. Lewis, Berkeley, Calif., assignor, by mesne assignments, to California Research Corp., San Francisco. An insecticidal composition comprising as its principal toxic ingredient pyrethrum and the benzene sulfonic acid amide from the reduced nitrogen bases from petroleum.

Trade Mark Applications

CONCENTRIC CIRCLES in front of triangle, with letters "1-A-A" at the three points of triangle, for insect spray, dry insecticides, liquid dip, mange oil, etc. Filed Sept. 5, 1946 by Illinois Agricultural Ass'n., Chicago. Claims use since 1930 on insecticides; and since 1932 on other uses of mark.

RATSTOP. In capital letters, with oversize "S" in center, for Rat exterminating powder. Filed Nov. 2, 1946, by The Rat Biscuit Co., doing business as the K-R-O Co., Springfield, Ohio. Claims use since Oct. 21, 1946.

NACO BRAND. Shaded letters within a circle. For insecticide and fungicide. Filed March 21, 1947, by Naco Fertilizer Co., New York Claims use since July 1, 1918.

DARWORTH, in capital letters, for insecticides. Filed July 1, 1947, by Darworth Incorporated, Simsbury, Conn. Claims use since June 11, 1947.

PREMIER - NURE, in slanting hand-drawn letters, for peat moss for fertilizers, combination fertilizer and soil conditioner, soil builder and plant food. Filed June 6, 1947, by Premier Peat Moss Corporation, New York. Claims use since Sept., 1946.

BENZO - FUME, in outlined capital letters, for fumigants, Filed Apr. 30, 1946 by Tobacco By-Products & Chemical Corp., Louisville, Ky. Claims use since Mar. 18, 1946.

SWIFT'S, in black capital letters, for agricultural sulfur chemicals used as a soil fumigant, insecticides and fungicides. Filed Aug. 8, 1946 by Swift & Co., Chicago, Ill. Claims use since Feb. 13, 1941.

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Insecticide, Fungicide Data

Carbide & Carbon Chemicals Corp., New York, has issued a series of new bulletins containing technical information on new insecticides available for experimental purposes and for commercial use. One experimental fly repellent is described in bulletin F-6928; experimental miticide #6 is described in bulletin F-7054; experimental fungicide #341 is described in bulletin F-6476-C; and experimental fungicides #640 and #658 are described in bulletin F-7053. Each bulletin gives the physical, biological and toxocilogical properties of the materials under discussion, and presents suggestions on how best to apply for optimum effectiveness. The literature is available from the company, 30 E. 42nd St., New York 17, N. Y.

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New S-W DDT Line

Sherwin-Williams Co., Cleveland, has announced a complete new line of DDT products to be sold under the family name of "DDTOL." The line includes eight different formulations of DDT, for numerous applications.

These include "DDTOL 25% Emulsifiable," for hand sprayers, low gallonage sprays, ground units and airplanes; "DDTOL 30% Solution" for forest insects, mosquitoes and other uses where oil is used; "DDTOL Vine-safe 50% Wettable," highly refined DDT with melting point of 103° C.; "DDTOL 50% Wettable," finely-ground powder for use as spray; "DDTOL 3%, 5% and 10% dusts for general agricultural use; and "DDTOL 50% dust" for use by manufacturers of finished dusts for both agricultural and household purposes.

Classified Advertising

Rates for classified advertisements are ten cents per word, $2.00 minimum, except those of individuals seeking employment, where the rate is five cents per word, $1.00 minimum. Address all replies to Classified Advertisements with Box Number, care of AGRICULTURAL CHEMICALS, 254 W. 31st St., New York 1. Closing date: 1st of month.

Positions Open

Agricultural Technician: To take charge of new products, labels, etc., for plant growth control chemicals, insecticides and soil fumigants. Must be able to travel. Reply stating qualifications, salary required, etc. Address Box 247 care of Agricultural Chemicals.

Salesman — Experienced man with following on West Coast wanted by eastern manufacturer and importer of chemical, drug, aromatic chemical, flavoring, etc. materials. Give experience, etc. other account now handled, etc. in letter. Address Box 250, care of Agricultural Chemicals.

Agricultural Insecticides: Old established chemical manufacturing company in New York Metropolitan area has position open immediately for man with Sales Manager qualifications in agricultural insecticides field. Should have knowledge of trade and newer insecticides. Your application, including statement of training and experience, will be kept strictly confidential. Chemical Dept., Position Securing Bureau, Inc. 45 John St., New York 7, N. Y.

Positions Wanted

Medical Entomologist, Ph. D., with sixteen years of civil and military experience desires a part time consulting position with an insecticide organization in the New York area. Address Box 242, care of Agricultural Chemicals.

Econ. Entomologist, M. S. desires position. 15 years experience research, techn. field tests, field representation. Address Box 243, care of Agricultural Chemicals.

Insecticide Sales or Production: Experienced man with over ten years of varied insecticide background. Interested particularly in South Eastern location. Address Box 244, care of Agricultural Chemicals.

Entomologist: Am now employed in large city. Desire position as Field Entomologist in east or mid west. Adress Box 245, care of Agricultural Chemicals.

Chemist, Ph. D. many years of experience in insecticides, fungicides, herbicides and disinfectants desires connection with either basic manufacturer or compounder on part-time or consulting basis, 2 weeks per month. Address Box 246, care of Agricultural Chemicals.

Insecticide Sale—Man with several years experience in sale of basic insecticide raw materials to the manufacturing trade open for new position with manufacturing supplier. For full details write to Box 248, care of Agricultural Chemicals.

ALVIN J. COX, Ph.D.
Chemical Engineer and Chemist
(Formerly Director of Science, Government of the Philippine Islands; Retired Chief, Bureau of Chemistry, State of California, Department of Agriculture.)
ADVISOR ON AGRICULTURAL CHEMICAL PROBLEMS AND INVESTIGATIONS
Consultant in reference to spray injury and damage, claims, including imports of fruits and nuts, formulas; labeling, advertising and compliance with law.
1118 Emerson Street
Palo Alto, California

CONSULTING ENTOMOLOGIST
Insecticides — Formulation
Plant Pathology — Research
Entomology — Legal Service
Eighteen Years consulting work.
Thirty years technical agriculture.
DR. E. R. de ONG
926 Stannage Ave., Albany 6, Calif.

Miscellaneous

Will Buy—Well-known manufacturer will buy going small business in chemical specialties, insecticides, or other household or agricultural packaged items. Send initial information in full confidence to Manfacturer, Box 249, care of Agricultural Chemicals.

Stock Labels, I.C.C. many others, write lists, Point, South Amboy 7, N. J.

•

Hamilton Company Formed

The H. W. Hamilton Co. has been formed in New York for the manufacture of insecticides, disinfectants, and bulk sanitary specialties. President of the firm is H. W. Hamilton who for the past 28 years has been associated with the White Tar Division of the Koppers Company. Vice-president and treasurer of the new company is Gordon M. Baird, head of Baird & McGuire, Inc., Holbrook, Mass. Offices in Washington, D. C. and Boston will be established in addition to the headquarters located at 34 E. 39th St., New York.

Mr. Hamilton is a past president of the National Association of Insecticide & Disinfectant Manufacturers, and is now secretary of the group. He is a graduate of Bates and of M.I.T., and served in World War I as a captain. He joined Koppers in 1929.

Mr. Baird is currently president of the NAIDM. His father, the late C. Campbell Baird, was one of the founders of the association in 1914, and a founder of Baird & McGuire Inc., Holbrook. Gordon Baird will maintain his headquarters at Holbrook, Mass., in connection with his duties as president of Baird & McGuire.

•

Virginia Deadline Set

Deadline for the registration of economic poisons in the State of Virginia has been set for June 29, it has been announced by Rodney C. Berry, State Chemist. These registrations, in accordance with the recently-adopted regulations do not require the sending of samples with application, except on special request. Forms will be supplied upon application to Rodney C. Berry, State Chemist, State Office Building, Richmond, Va. The procedure will follow the uniform registration being used by numerous states.

Advertisers' Index

Agricultural Sulphur & Chem. Co. ..... Apr.
American Cyanamid Company ... 64
Andrews, W. R. E. Sales Co. 85
Atlas Powder Co. 48
Associated Chemists, Inc. 82
Attapulgus Clay Co. 4
Baird & McGuire, Inc. 16
Bagpak, Inc. 19
Baker, J. T. Chemical Co. .....11 & 66
Boyce Thompson Institute 76
Calif. Industrial Minerals 58
Carolina Pyrophyllite Co. 82
Chipman Chemical Co. ..... Apr.
Clinchfield Sand & Feldspar Co. ... 84
Commercial Solvents Corp. ..... Apr.
Cohutta Talc Co. 65
Colloidal Products Corp. 74
Cox, Dr. Alvin J. 88
De Ong, Dr. E. R. 88
Derris, Inc. 84
Dobbins Mfg. Co. 80
Dow Chemical Co. 7
E. I. du Pont de Nemours & Co... Apr.
Entoma 82
Eston Chemicals, Inc. 89
Faesy & Besthoff, Inc. 83
Flag Sulphur Co. ..... Mar.
Floridin Co. 77
Food Machinery Corp. 38
Geigy Co., Inc. 60
General Chemical Division, Allied Chemical & Dye Corp. ...2nd Cover
Greeff, R. W. & Co. 57
Griffin Chemical Co. 73
Hanson, Howard & Co. 40
Hauck Mfg. Co. 86
Hercules Powder Co. 6
Hudson, H. D. Mfg. Co. 56
Hyman, Julius & Co. ..... Apr.
Kennedy Minerals, Inc. 84
Kolker Chemical Works 78
Lawrence Aero-Mist Corp. 52
Lowell Mfg. Co. 36
Manufacturers' Aid Co. ..... Mar.
McLaughlin Gormley King Co. ... 71
Merck & Co., Inc. ..... Apr.
Michigan Chemical Co. ..... Feb.
Monsanto Chemical Co. .....8 & 9
Mulsimo Products, Inc. 86
Naugatuck Chem. Div. ..... Feb.
Niagara Sprayer & Chem. Div..... 79
Norgren, C. A. Co. 42
Oberdorfer Foundries, Inc. 10
Orbis Products Corp. 44
Penick, S. B. & Co. 20
Pennsylvania Salt Mfg. Co. 17
Pest Control Ltd. 84
Pittsburgh Agri. Chemical Co. 34
Phelps-Dodge Refining Corp. ..... Feb.
Pioneer Pyrophyllite Producers ... 86
Powell, John & Co. .....18 & 32
Prentiss, R. J. & Co. .....3rd Cover
Reinhold Publishing Co. 76
Rohm & Haas Co. 46
Sherwin-Williams Co. 50
Shell Chemical Corp. 68
St. Regis Paper Co. .....12 & 13
Southeastern Clay Co. 71
Spraying Systems, Inc. 65
Sprout, Waldron & Co. 3
Standard Agricultural Chem. Co. 86
Stauffer Chemical Co. .....67 & 81
Tennessee Corporation ..... Apr.
Thompson-Hayward Co. 54
Tobacco By-Products & Chemical Corp. 59
Todd Shipyards Corp. ..... Apr.
United Clay Mines 62
U. S. Industrial Chemicals ...4th Cover
Universal Metal Products Co. ...Mar.
Vanderbilt, R. T. & Co. 75
Varley, James & Sons ..... Feb.
Velsicol Corp. 15
Westvaco Chemical Corp. .....14 & 72
Wisconsin Alumni Research 80

(The Advertisers' Index has been carefully checked but no responsibility can be assumed for any omission.)

AMAZING

NEW

ORGANIC PHOSPHATE INSECTICIDE

Eston

★ TETRON

Tetraethyl Pyrophosphate—Technical

BETTER KILL

LOWER COST

This amazing new basic insecticide material is a revolutionary improvement on standard HETP for control of aphids, spider-mites and other insects.

Eston TETRON has approximately twice the strength of standard HETP and the price per unit of active ingredient has been drastically reduced.

AVAILABLE IN 3 FORMS:

TETRON 100

A straight chemical containing 100% active ingredients.

TETRON 50

50% active ingredients plus 50% solvent and emulsifier.

TETRON 25

25% active ingredients plus 75% solvent and emulsifier.

Eston TETRON is manufactured under the same close chemical and biological control that characterizes Eston HETP. Each plant run is checked before shipment to guarantee uniformity of performance.

Immediate delivery — substantial quantities. Write or wire for full price and technical information.

In the West it's Eston

Eston TETRON

*TRADEMARK REGISTERED

Eston

CHEMICALS, INC.

3100 East 26th Street

Los Angeles 23, California

"Somebody got dere wires crossed here, Cuthbert!"

Wrong place . . .

SNOW in the Fiji Islands is no more out of place than some advertising. But error is easily avoided. If it's advertising to industry, run it in industrial publications, those specializing in covering fields where the stuff is actually bought. Good industrial and business publications will always give the facts and figures about their coverage in plain words and numbers,—and minus a lot of the big-word advertising double-talk.

If, for example, it's in the field of agricultural chemicals that you want to sell, we suggest that the right place to advertise is in the pages of

AGRICULTURAL CHEMICALS

254 WEST 31st STREET **NEW YORK 1**

TALE ENDS

Sherwin-Williams Company has launched a "Fly-Free Community" campaign being publicized throughout the U.S. In cooperation with the U.S. Junior Chamber of Commerce, the program is slanted to appeal to the civic mindedness of local chamber chapters. Literature being distributed points out that flies and mosquitoes cost $165 million a year in disease, depressed real estate values and food losses, and dramatizes some of the outstanding jobs done last year in a few communities with DDT and unified action. A "how to do it" outline is given with a "week-to-week timetable for a successful anti-fly campaign" extending from April first to the middle of September. Extensive local publicity is being handled by Junior Chambers.

•

Robbed again! Writes a dealer in coal, feed, garden supplies, etc. out in Kansas: "Please send me another copy of A.C. The last issue proved to be so interesting I have not been able to keep it in my possession long enough to read it myself."

•

The trend toward terming as "Applicators," all equipment used to apply sprays, dusts, mists, or fogs, seems to be gaining momentum. In farm publications the term is being used generically, so it probably won't be too long until this may become a universal practice.

•

Revulsion Emulsion

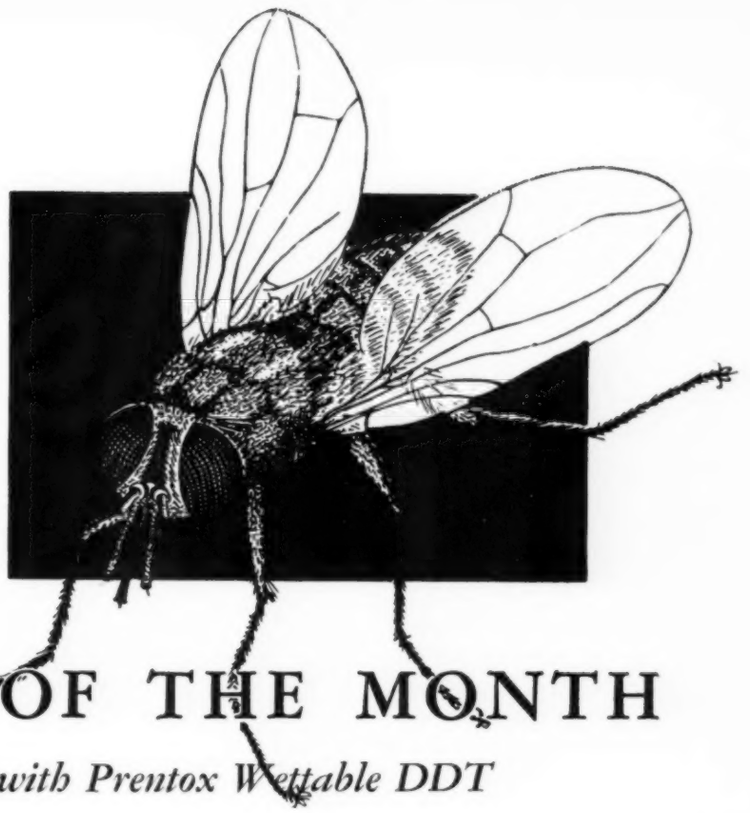
Initials confuse.
What else shall we use?
Asks the Insecticide-Fungicide News.
Number them from 1 to 8,
Those compound terms to indicate,
Or just go right ahead and say't:
Copper oxychloride sulfate
Hexa-ethyl tetraphosphate,
Or just BHC or a plain DD?
And EDE and a TCP.
What is it for, Oh
What do they mean
By 1, 3-dichloro-
Propylene?
Faced with Diphenyl dichloroethane
Insects turn up their toes and die.
They go insane!
. . . And so shall I!

—*Detroit News, Feb 22, 1948.*

PRINTED BY WATKINS PRINTING CO., BALTIMORE

HORN FLY

(*Haematobia irritans* Linne)



BUG OF THE MONTH

...controlled with Prentox Wettable DDT

FROM early April until the sharp frosts of October, swarms of horn flies hover over cattle whenever they are out of doors. Similar to the stable fly, but only half as large, these blood-sucking pests cause such pain and annoyance that they interfere with both feeding and resting.

The cattle lose weight, yield less milk, develop indigestion, and suffer other disorders. Further, the horn fly is suspected as a carrier of anthrax which, once established in a herd, can result in even more serious economic loss.

Yet this scourge of pasture, range and feed-lot can be controlled, at low cost, with sprays formulated from Prentox DDT Concentrates. Prentox Micro-Mesh Wettable—or for special applications Prentox 25% Water-Miscible DDT—are ideal for this purpose.

We suggest that you put major emphasis, in your 1947 livestock spray program, on the attractive new idea of "fly-proofed" cattle. Extra cash returns to the rancher, dairyman and feed-lot operator—in terms of more beef and milk per animal—will far outweigh the cost of spray required.

Your inquiries are invited. Our specialized knowledge of insecticides is always at your disposal—for the development of consistently better insecticides.

R. J. PRENTISS & CO., Inc.

110 WILLIAM STREET, NEW YORK 7, N. Y. 9 SO. CLINTON STREET, CHICAGO 6, ILL.

MAKERS OF PRENTOX PEST-TESTED CONCENTRATES
SOLD ONLY TO INSECTICIDES MANUFACTURERS

DDT POWDERS AND LIQUIDS • ROTENONE PRODUCTS • SABADILLA DUST • BENZENE HEXACHLORIDE • PYRETHRUM PRODUCTS

NOW AVAILABLE

Cyclonene dust base

(5% technical piperonyl cyclonene impregnated on an inert carrier)

Piperonyl cyclonene is ideal as an essential ingredient in garden dusts and similar preparations because —

- **It is extremely potent against a wide variety of insects.**
- **It has a high degree of synergism with both pyrethrum and rotenone.**
- **It is safe to use on edible vegetables and fruit . . . leaves no poisonous residues.**

U.S.I. Cyclonene Dust Base is available to formulators as a dust easy to mix with diluents and other ingredients. It is compatible with pyrethrum, rotenone, nicotine sulfate, basic coppers, and similar compounds. Its use permits maximum flexibility of formulation and ease of operation.

BUY U.S. SECURITY BONDS NOW!

U.S.I. INDUSTRIAL CHEMICALS, INC.

60 East 42nd Street, New York 17, N. Y.

Branches in all principal cities